The International Journal of
Orthodontia and Oral Surgery

VOL. V ST. LOUIS, JUNE, 1919 NO. 6

ORIGINAL ARTICLES

A REMOVABLE RETAINER*

BY C. A. HAWLEY, D.D.S., WASHINGTON, D. C.

AT the meeting of this society in Chicago, July, 1918, in the course of a discussion of Dr. J. V. Mershon's paper, I incidentally mentioned a removable retaining device which I had been using with some success. My further experience with this retainer has been so gratifying that I now feel justified in presenting the matter more in detail.

As I stated at the time, my first ideas of the retainer were gained from Dr. R. D. McBride, of Dresden, Germany, while visiting his office in 1906. He had been using a form of retainer for several years which embodied certain basic principles, the value of which impressed me very strongly.

This device consisted originally of a rubber roof plate with heavy flat bars of metal passing between the first molars and second bicuspids to the buccal surface. These bars on the buccal surface were fashioned into planes which slid back of similiar planes on the lower apparatus for the purpose of holding the proper mesio-distal relation of the two jaws. A piece of 17-gauge round wire extended around the outside of the arch in contact with the labial and buccal surfaces of the teeth and was fastened at either end to the bars which passed between the teeth as previously mentioned (Figs. 1 and 2). He used also in some cases, instead of a roof plate a very heavy wire bent to the lingual surface of the teeth as shown in the illustrations.

The use of the retainer as made by Dr. McBride was never very successful in my hands, yet I have considered the principles upon which it was based so promising that I have persisted in its limited use and study since that time. One after another the most objectionable features have been eliminated, until I now have great confidence in its practicability and have used it almost to the exclusion of everything else for a couple of years.

*Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 11, 12, 1919.

It is hardly necessary to enumerate the obviously objectionable features of this original appliance, yet it might not be out of place to mention some of them.

First, the wide spaces necessary between the first molars and second bicuspids were often troublesome. Food often became packed in a pocket under the bar and often the bar was pushed down further than intended through the

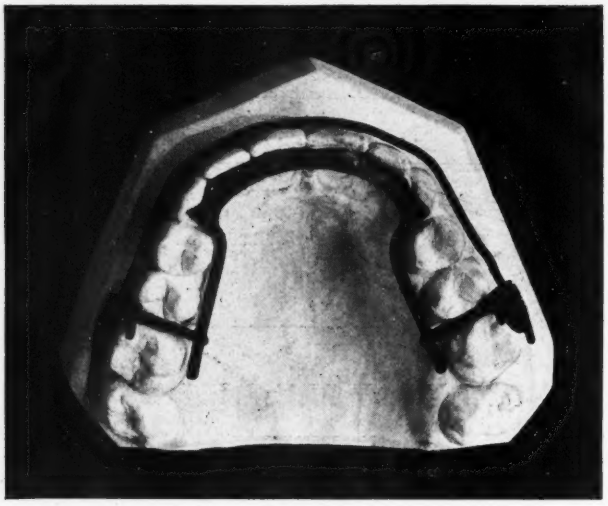


Fig. 1.

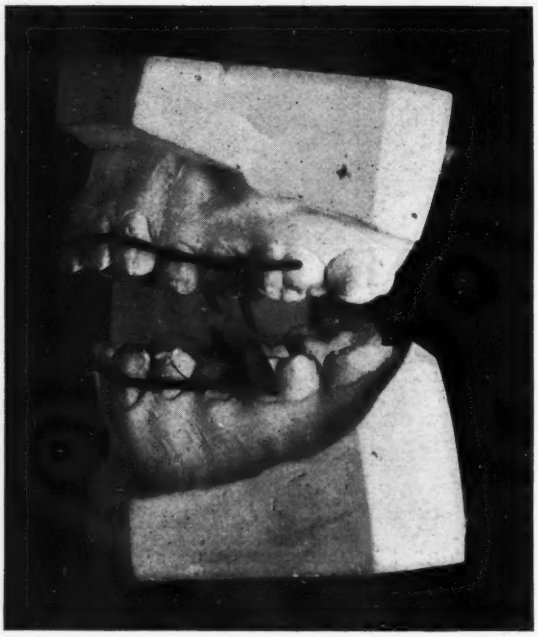


Fig. 2.

breaking or displacement of the stops. Then, if the appliance was left out a few days the spaces would close. This possibility prevented a most important final use of the retainer which will be described later.

Second, the side planes for holding the mesio-distal relation I found successful in only a few cases. With our present understanding and practice, I think they are wholly unnecessary.

Third, the labial wire was too heavy and had too long an extension without supports.

Fig. 3.

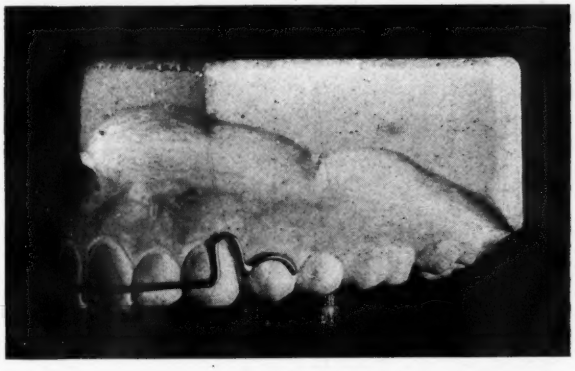


Fig. 4.

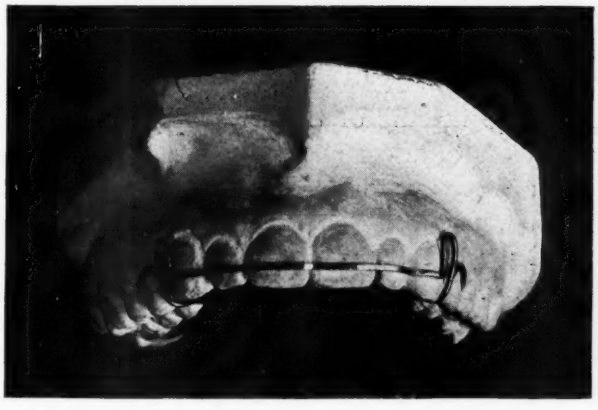


Fig. 5.

The retainer as I am now using it consists of a skeleton plate fitting accurately the lingual surfaces of the teeth. From the plate, back to the cuspids, where there are always spaces even in closely occluding dentures, passes a 19-

gauge gold wire, which is formed into loops, and between them passing over the labial surfaces of the incisors is a flat wire .022x.036. Attached to, and extending backward from the 19-gauge wire is a bicuspid clasp (Figs. 3, 4 and 5). On the lower a wire hook is embedded in the plate and passes between the lingual cusps of the first molar over the margin of tooth to keep the plate from being pressed down at the heels. (Fig. 6.)

If it is desired to correct or hold the overbite, a flat ledge is built on the upper plate. This can be extended into a bite-plane to assist in correcting or holding the mesio-distal relation where it is needed (Fig. 7).

There are four important movements that must be provided against in retention:

First: The expansion and form of the arch.

Second: The rotated teeth must be prevented from returning to their former positions.

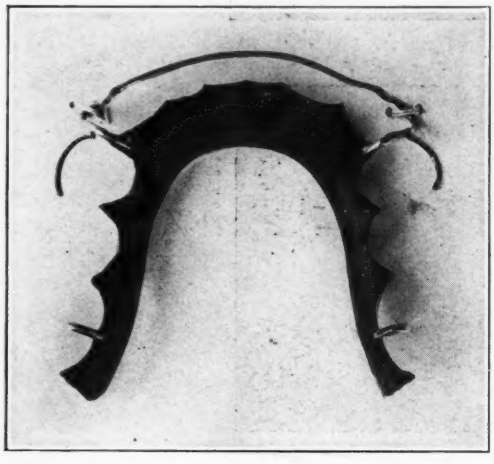


Fig. 6.

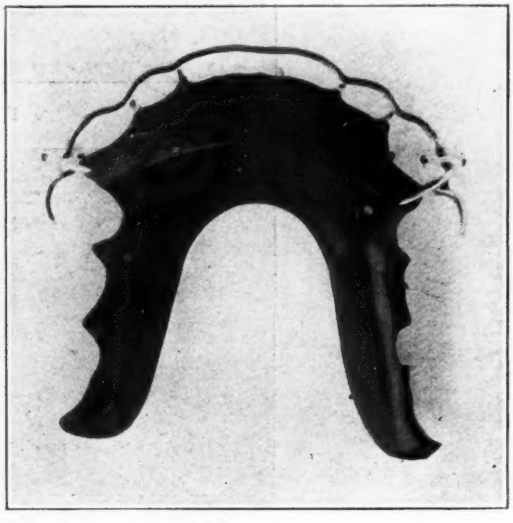


Fig. 7.

Third: The mesio-distal relation must be maintained.

Fourth: The overbite must be established.

As for the first, the holding of the expansion and form of the arch, the efficiency of a plate needs little comment. It is one of the oldest and most reliable means used for that purpose.

As for the second, the retention of rotated teeth, the possibility of this method most aroused my interest in Dr. McBride's appliance and I might say my skepticism as well. However, I may say that I am now succeeding better in holding such teeth by this method than I have by bands or spurs or any other method I have ever employed. By glancing again at this device (Fig. 3), it will be seen that in order to rotate, a tooth must lift away from the plate which closely fits the palatal surface. This the labial wire prevents it from doing. If a tooth is seen to start in this movement the wire may be made to press harder at this point, the tooth will return to place and the movement will be stopped. The question might naturally arise, why the device succeeds while lingual and labial wires combined, soldered to cemented cuspid bands are gen-

erally a failure in preventing incisor teeth from rotating. The reason probably is that no wire has been made to fit the lingual surface as accurately as does the plate and would not be safe from injury to the tooth, if it were not removable, even though it were so fitted. Also the labial wire in such a cemented device has not the same elasticity or adjustability.

There are some exceptions to be made to the teeth that may be held from rotation with this retainer. Round or commonly called peg-shaped lateral incisors or lower bicuspids for obvious reasons can not be retained by this means. For the latter I use a cemented band with a flat vertical bar attached, which fits

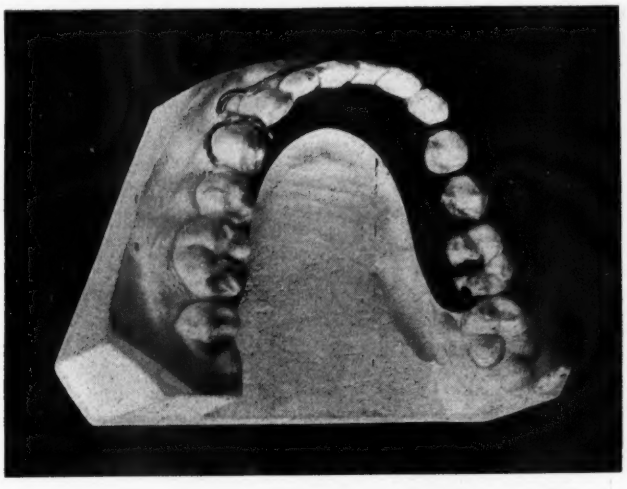


Fig. 8.

Fig. 9.

into a slot in the plate (Fig. 8). To hold the second bicuspids when rotated, it is necessary to extend the bicuspid clasp over these teeth (Fig. 9).

As to the third, the mesio-distal relation, this has been one of the most troublesome problems in the development of this retainer. The use of intermaxillary rubbers with a removable fixture is impossible unless some bands are used to make it semifixed and these bands seriously detract from the perfection of the retainer. However, I have found that if the arches are so harmonized that the forward and proper occlusion is the only comfortable one for the patient and all interfering cusp relations corrected, and with the help of muscle exercises developed by Dr. Rogers, we will have very little, if any, need of former methods of retaining this relation. In extreme cases as previously men-

tioned the old form of bite plane can be constructed on this plate and gradually removed as it is found that it is no longer needed.

Fourth, the overbite is retained and can be corrected by building on the plate a flat or slightly inclined shelf back of the incisors.

The method of construction is very simple. The wire framework is made on a model of plaster or artificial stone (Fig. 10). These I have bent by hand with bending pliers. The wire, embedded in the plate and up to the end of the loops is 19-gauge clasp gold or Ney's "E" wire. The portion from this point passing over the labial surfaces of the incisor teeth is flat or ribbon wire .022 x .036, the size of Angle's ribbon arch wire. I prefer Ney's "E" wire for this

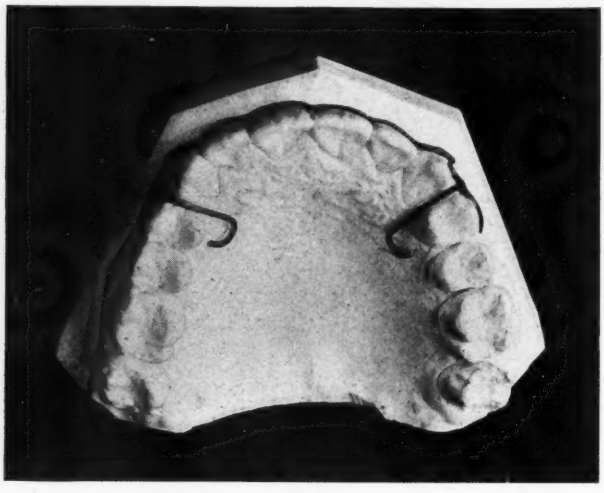


Fig. 10.

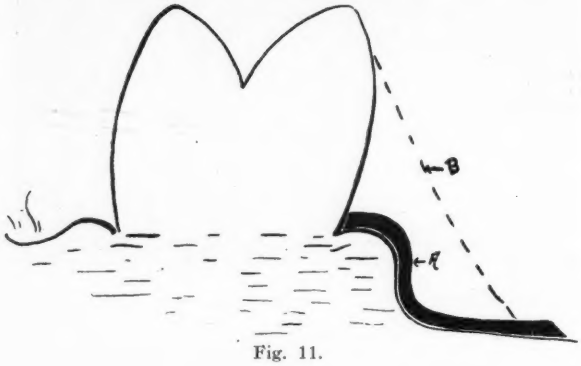


Fig. 11.

also. The union is made with 18 karat solder. The flat wire is slightly festooned to fit the labial surface of these teeth. Extending backward from the loop is a bicuspid clasp, soldered to the loop. This is 19-gauge "E" wire. The convex form shown in the illustration has been very successful. It is important that it should pass over the bulge of the bicuspid with some spring and lie at rest, without tension, near the gum line. After the framework is finished the plate is waxed up and vulcanized.

It is essential that the rubber plate should be as tough and springy as possible. The waxing should be accurately done without surplus and vulcanized between two sheets of No. 60 tin foil. The plate, where it comes in contact with

the lingual surfaces of the bicuspids and molars, should be thin so as to spring over their convex lingual surfaces and thus assist as much as possible in holdin the plate in position (Fig. 11). The use of a rug-a-pack to reproduce the natural rugæ of the mouth adds materially to the comfort of the plate.

After making ten gold plates, both cast and swaged, I have abandoned them altogether and replaced every one with rubber plates. They were preferred by the patients on account of the lightness, and by myself on account of the greater simplicity of construction and ease of changing the part in contact with the tooth. One idea that I had was that the wires could be mended easier when broken with the gold plate, but I find that by using a strip of wet cotton in contact with the rubber held with a pair of pliers, the wires can usually be mended successfully on the rubber plate.

My scheme for the use of the retainers is as follows: They are only used when the denture is complete, that is when there are no deciduous teeth remain-

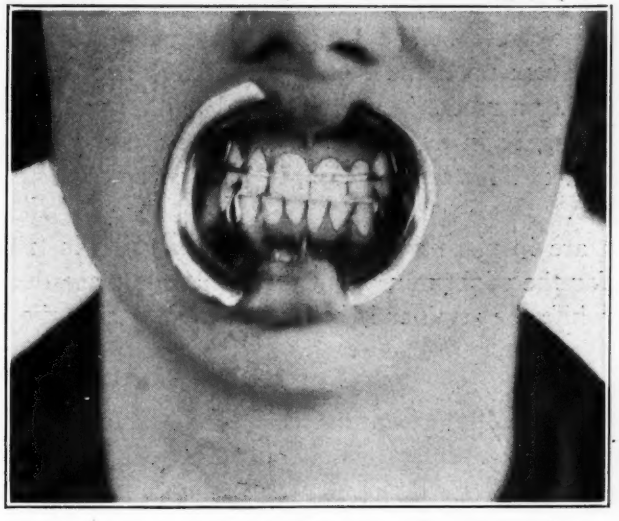


Fig. 12.

ing in the mouth. When the case is ready for retention, I take the impression, make the plate and fit it carefully in the mouth, adjusting the labial wire so that it is in contact with each tooth. A piece of floss silk passed between the wire and the teeth will help to determine this fact. The patient is instructed to wear them constantly, removing them only for cleaning, and if necessary while eating. They should be examined in a few days or a week, and any small adjustments made that are necessary. They are worn constantly for two to six months, during which time they should be occasionally examined. If, during this time the patient wishes to remove them for a few hours for some special engagement, it can be done without harm. After this period, I have found that wearing them at night only, is sufficient. Prophylactic treatment or filling operations can, of course be done without interference at any period of the retention. It will be understood that if there is a bite plane, its work must be finished and the molars and bicuspids must be in close occlusion before the constant wearing is abandoned.

After they have been worn at night for about a year, they can be left out

for several days or a week and then tried in. If they bind or go in hard, it is evident that the teeth are changing and the nightly use must be resumed. The patient can thus keep the plates for years as a check against retrograde movement and we have a provision for the different lengths of time that different cases need retention. This important feature could not be utilized in Dr. McBride's retainer on account of the closing of the spaces between the first molar and second bicuspids. In some cases of patients going to foreign countries I have two sets made to be used in case of loss or breakage.

The appearance in the mouth is not displeasing (Fig. 12), in fact, much less so than most fixed retention. Where teeth are missing from any cause, they can be satisfactorily supplied during retention by attaching to the plates.

A considerable amount of movement can be accomplished with this retainer. Either arch can be expanded a small amount by heating in the center, stretching and then cooling in that position. The position of a tooth that is labial to the proper line can be corrected by cutting back the plate with a small stone, being careful, however, to preserve the form of the lingual surface, then adjusting the labial wire to press upon the tooth. Teeth that are slightly lingual can be moved out by cutting a recess in the plate and building on cement, amalgam or fusible metal. Thus, if in an emergency, it is necessary to retain before the teeth are quite in a satisfactory position, it can be done and the final movement accomplished later.

If the teeth are in place at the time the impression is taken, no fear need be experienced for the slight movement that will take place during the few days that will elapse while the retainer is being made. Wearing the retainer a day or two will bring them back to the positions they occupied when the impression was taken.

In conclusion, I wish to say that no claim whatever is made in this retainer for originality or invention. It is a new adaptation of some of the oldest things in orthodontia. Its development has consumed considerable time and thought, but the relief from the uncertainties of fixed retention in my own practice has been ample compensation. I have no idea that it is perfect or can not be improved, but am offering it to the society with the hope that many helpful suggestions will be made.

DISCUSSION

Dr. Ralph Waldron, Newark, N. J.—Mr. President, Members and Guests of the American Society of Orthodontists: There is but very little I can say in opening the discussion on Dr. Hawley's paper except to endorse it, and this I most heartily can, for it has been a great aid to me, not only as a retainer, but as a working appliance, in certain cases which I will explain later.

About three years ago while visiting Dr. Hawley in Washington our conversation drifted to the problem of retention, and in his remarks Dr. Hawley said, "I have a copy of a paper written by Dr. R. D. McBride of Dresden, Germany, on a removable retainer, which possesses some admirable features, also some disadvantages, I will let you take it.

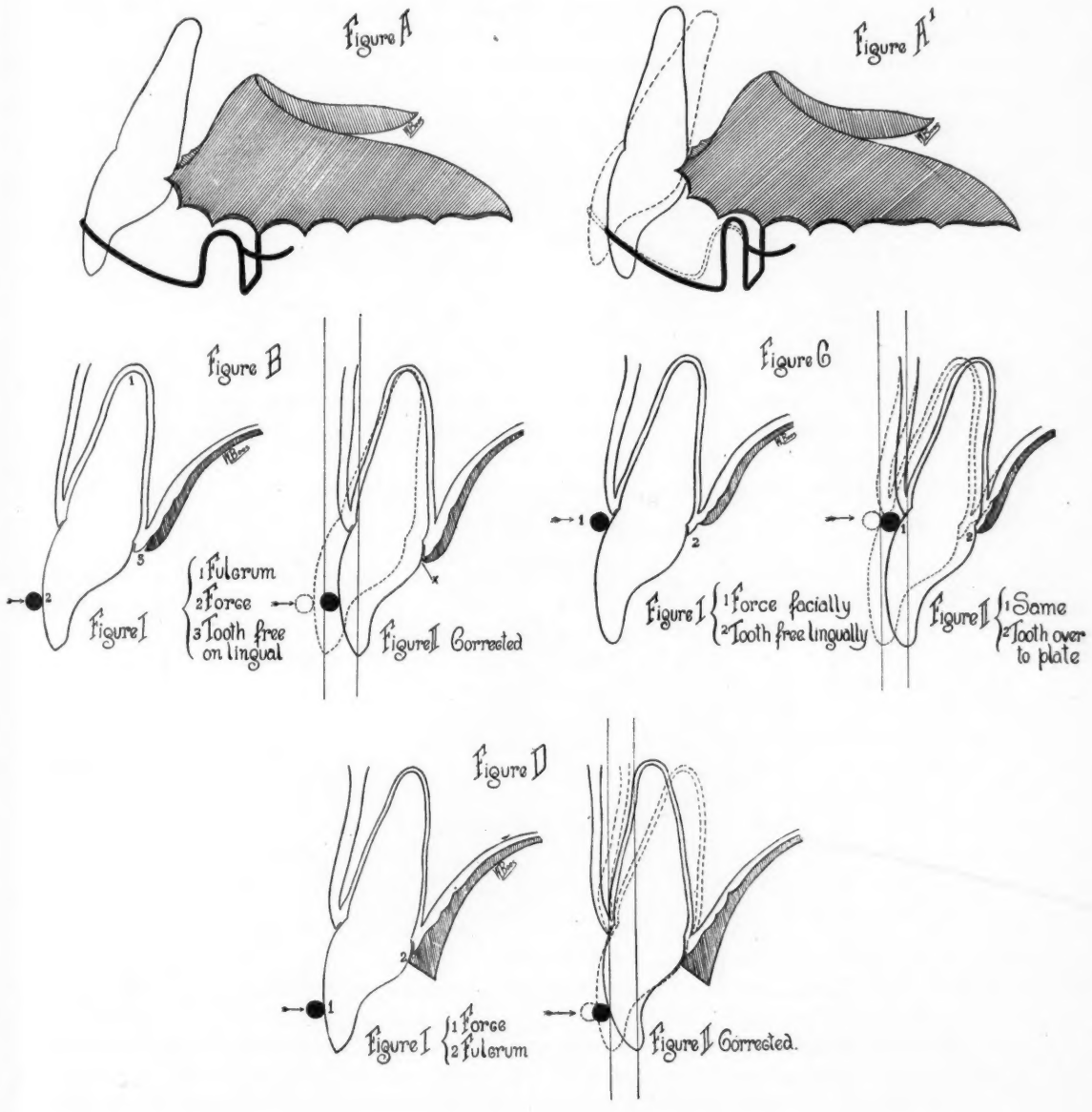
On one of my subsequent visits to Dr. Hawley, I found he had overcome some of the objectionable features, such as more secure attachment, closer adaptability, simplicity of adjustment, etc.

I went home most favorably impressed with the removable retainer, and began using it almost exclusively with its various modifications to suit the case at hand.

I do not wish to discuss the construction of this appliance, for Dr. Hawley has already done so, but will try to explain the dynamics of it.

Fig. A shows the retainer with a loop in the labial alignment wire for the adjustment of the same, and a wire clasp which fits accurately on the first bicuspid tooth, making a very secure attachment.

If we close up the loop which is located in the canine region a millimeter or so, the labial alignment wire is shortened just that much, bringing the six anterior teeth into a



more normal approximal contact, and also into a more lingual position than they previously occupied.

This is well shown in Fig. A[1].

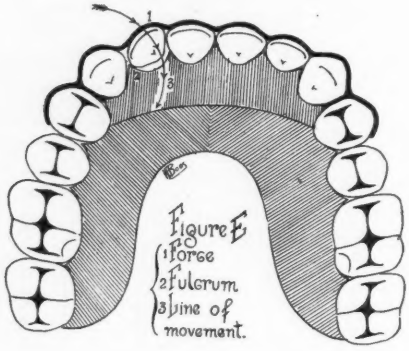
Fig. B shows a sectional view of an incisor tooth and a removable retainer. The shaded portion in a cross section of the vulcanite portion of the retainer, and the dark circle shows a cross section of the labial alignment wire.

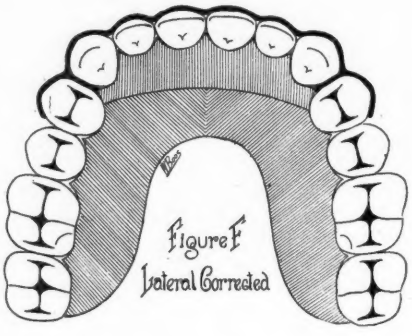
If the force is applied in the direction of the arrow by closing the adjusting loop

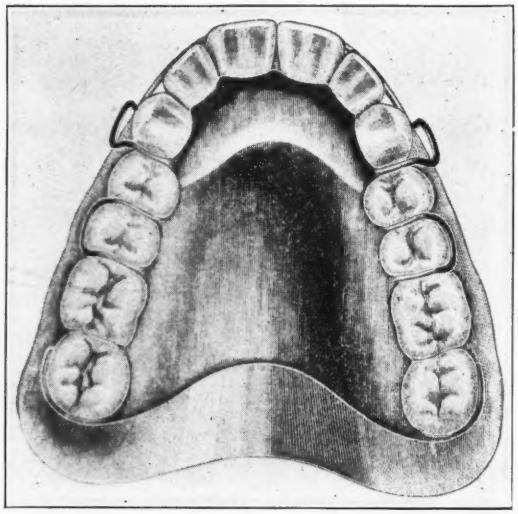
of the labial alignment wire, then the fulcrum will be at the apex of the tooth *I*, and the tooth will be moved until it comes in contact with the vulcanite portion of the retainer at the point *X* as shown in Fig. II corrected. Then if more force is applied at *2*, the point *X* becomes the fulcrum and we now change from a lever of the second kind to a lever of the first class, which would result in moving the apex forward.

Fig. C shows the alignment arch close to the gingiva. If force is applied in the direction of the arrow, the tooth will be moved toward the lingual more bodily than in the previous Fig. B.

In the treatment of distoclusion cases, particularly when accompanied by labioversion of the upper incisors which are often considerably elongated (Class II, Division 1 Angle), this is an admirable posttreatment appliance.







Reproduction of Fig. 403 from Jackson's book on Orthodontia.

We can not expect to equalize the arches with this appliance, but we can change the angle of inclination of the incisor teeth, and keep the mandible forward without intermaxillary elastics by means of a bite plane attached to the appliance as shown in Fig. D, thus depressing the incisors both upper and lower, and opening the bite in the posterior region, which will permit of the elongation of the bicuspids and molar teeth if the case so requires it.

Fig. E shows an occlusal view of this retainer in position. You will observe the right upper lateral in torsoversion. If the labial alignment arch is bent so as to bear with slight pressure on the mesial approximal angle, the tooth will be moved as indicated by the arrow until it occupies its correct position as indicated in Fig. F.

While this appliance is new to us as a retainer and a great deal of credit is due to

Dr. Hawley for its development, I find Dr. V. H. Jackson used a similar appliance as shown in Fig. 403, Jackson's *Orthodontia,* 1904 edition, for jumping the bite forward, a term used in those days for bringing the mandible forward.

Dr. Jackson makes no mention of using this appliance as a retainer as will be seen from the following description of Jackson's appliance found on page 340 of his book, and you will note from the illustration and description that the clasps for attachment are dissimilar from those advocated by Dr. Hawley.

"Jumping the Bite Forward.—When the jaws are inharmonious in their mesio-distal relations, and jumping the bite forward is indicated, any spaces that exist between the teeth of the upper arch should first be closed by moving them inward, and an apparatus anchored in each arch for the attachment of small rubber bands for causing the required anterior and posterior traction as described; or a semicircular spring can be shaped to pass in front of the incisors with the ends anchored in a palatine vulcanite plate used to support an inclined plane, as seen in Fig. 403. The plate is made with suitable means of anchorage, as with spring or wire clasps, with a projection of rubber extended from the anterior part sloping sharply downward and backward for forming the inclined plane; it should be shaped so that during occlusion it will pass back of the lower incisors and cuspids, causing the lower jaw to be moved forward for a distance usually equal to the width of one of the bicuspid teeth. The closing of the lower incisors against the inclined plane in the manner described has the effect of stretching the lower jaw, encouraging its anterior development."

Dr. Hawley recommends that you wax up these retainers and send them to the laboratory to be vulcanized and finished.

This procedure I would condemn for they are very likely to file and polish away the very parts you need and thereby ruin the retainer, particularly if you have a bite plane which is to perform other functions than keeping the mandible forward, which I have previously mentioned.

Dr. Alfred Paul Rogers, Boston, Mass.—A few weeks ago it was my privilege to spend several hours with Dr. Hawley in his office, during which time I examined five or six patients who had reached that stage of treatment where the application of the removable retainer, which Dr. Hawley has been telling us about, seemed to be beneficial. One of its features that impressed me particularly was its value from a prophylactic standpoint. In many cases it would seem that the patient might be rid of bands and wires of various sorts at least a year in advance of the other modes of retention. The teeth, being free from unnecessary restraint, are enabled more readily to settle into final adjustment. I believe it is going to be particularly valuable in undertaking muscular work in an endeavor to establish functional activity which is so essential to the permanence of occlusion.

Of course, I imagine there are some types of irresponsible patients where it might prove disadvantageous to make use of this kind of appliance, but the failures on this account would be few. The appliance is used mostly on patients who have had considerable experience, being applied when the case is nearing completion.

Dr. Burt Abell, Toledo, Ohio.—I am anxious that this appliance and Dr. Hawley should have all the credit that is due it and him, but there is one thing to its advantage, it seems to me, that has not been mentioned either by Dr. Hawley or Dr. Waldron.

In a fixed retention attached to any tooth, cemented, of course, with both upper and lower fixed, it takes a very successful man to so adjust tube that there will not be a spring of one jaw or the other in the teeth where the bands are cemented. The posterior teeth, the bicuspids and molars, with this appliance, are perfectly free to move in any direction that the occlusion seems to force them. They can settle together without any interference with the appliance. They can settle into normal occlusion so far as the adjustment of the appliance is concerned. That is one disadvantage I find in using the Lourie retention. Unless I am careful to use a horizontal tube between the jaws, either upper or lower, there is a spring of one set of molars or bicuspids. That is one disadvantage it seems to me, because we all admit that every tooth should have all the freedom possible to move in a normal arch or circuit, or whatever you may call it, retained only

so that it does not get out of position. The disadvantage to my mind occurs in the anterior teeth. There is not sufficient mobility, in my judgement, with the bar across the front, and what amounts to a bar, the vulcanite rubber at the back.

Dr. Ralph S. Baldwin, Washington, D. C.—I would like to add a few words to what has already been said with regard to this retainer. I have worn these retainers for something over a year, and I have put them to every kind of use and abuse for experimental purposes, and personally I cannot say too much in favor of them. As the doctor said, I used the appliance for my case of protrusion, and my upper teeth shut inside of the lower. After two years or more of treatment I established very fair occlusion and have maintained it with these retainers.

There is another added feature. I lost recently a right lateral, and I immediately took an impression and attached to the appliance another tooth and it worked nicely indeed. There are some cases in practice where the teeth are congenitally missing or fail to come in, or there may be reason for maintaining spaces, and instead of the wire clasp and leaving a space, this plate can be utilized to supply the missing tooth.

I have had the opportunity along with Dr. Hawley of applying two hundred of these retainers, and we can show you how simple this retaining appliance is.

Dr. Frank M. Casto, Cleveland, Ohio.—I would like to ask Dr. Hawley whether or not the patient wears this retainer continuously.

Dr. Hawley.—I answered that question I think in the paper. These retainers can be removed at any time, for two or three or six or seven months I have them worn day and night, according to the character of the case. After about six months, which is not a definite time, or after a certain time they only need to be worn at night.

Dr. F. M. Casto.—The point I want to bring out is this: Whether or not the continuous wearing of the plate will interfere with the function of the soft tissues about the teeth, and whether or not this interference with the soft tissues may not change the secretions of the glands and make the teeth more liable to decay because of that fact. I wonder whether Dr. Hawley has noticed that particular thing.

Dr. Hawley.—You must remember that this plate is not worn continuously, and the effect of vulcanite on the mouth is nothing so far as I have observed. So far as the condition of the teeth and health of the patient are concerned, there is no one closely connected with me, who has been so delighted with this retention as Dr. Gearhart of Washington. He is a periodontist, and a great many of my patients go to him for treatment. During retention these plates can be slipped off and the teeth can be properly cleansed. They have noticed absolutely no effect upon the soft tissues from wearing the plate. As I have said, they are not wearing these plates continually. The night wearing of the plate does not affect the mouth.

Dr. George B. Winter, St. Louis.—If a child had the lateral incisors missing, I would like to ask Dr. Hawley how long the child could wear a plate of this nature?

Dr. Hawley.—I do not know. We supply these teeth during the retention period, and there comes a time when the missing teeth must be replaced. You can stop this retention when you please. If you reach the stage that you should want to supply a missing tooth permanently, a new plate must be made or the entire retention abandoned. That can be decided by conditions.

Dr. Ralph S. Baldwin.—In cases where the teeth are slightly rotated, with a tendency to be lingual to their normal occlusion, before the plate is waxed up, the lingual surfaces of the teeth on the model can be slightly cut away, and there will be an excess of rubber that will contract with the rotated tooth. After wearing the plate for a day or so, the tooth will be forced into the desired position. If you recognize that when you wax the plate up it will be more satisfactory than adding cement or other filler because naturally these wear away.

I have had several cases in which, when I took the apparatus off, the perspective looked almost perfect, but when it came to a more careful and minute examination I could determine to a fraction here and there that corrections should be made. In bending the wire on the labial surfaces of the teeth, if a tooth is rotated, it naturally causes an irregularity in the outside contour line, and this irregularity is sometimes shaved down

and the wire is passed squarely over it. When the plate goes into the mouth the labial wire will come in contact more strongly at that point where the plaster was cut down. By thus cutting and fitting and adjusting the plate accurately and forcibly with the bicuspid clamp, a great deal of the final and accurate finish of the work can be accomplished.

Dr. V. E. Barnes, Cleveland, Ohio.—Dr. Hawley made the statement that this appliance was not original with him; that it was Dr. McBride's idea. I used this appliance or a similar one for six or seven years, but have not employed it for the last four or five years because I found too much decay occurring under the plates. The temptation is too great to let the patient go for too long intervals between visits.

Dr. Casto raised the point as to whether the continuous wearing of rubber over gum tissue did not in some way deteriorate the tooth structure. I am inclined to think it does, but whether it is from irritation or change of function, or overheating or something of that sort, I do not know; but I do know that a tremendous amount of decay has occurred in some cases and the observation was not *post hoc*.

I have given up the use of the plate until I could get enough help to make a metal plate.

Before I leave the subject, I want to ask Dr. Waldron about one point. He stated that in putting pressure on the central incisor to the plate somewhere after this fashion (indicating), he put it far enough so that the pressure did not hurt and the tooth would be shortened.

Dr. Waldron.—If you have rounded central incisors and get above the portion with the plate up high on the lingual surface, there is pressure in that direction (indicating on blackboard), while resistance is exerted in the other direction. That is not any particular gain.

Dr. Barnes.—That can not happen in any case. The plate will drop by the force of gravity because there is nothing to hold it unless the plate is held around the tooth. If you want to put that amount of pressure on, you should have small attachments, metal pieces, such as we put in between plates like these and drill a hole in the plaster cast and put in a pin and force this down the proper distance. If you put this on both sides we get a locking device by the constriction of the tooth below the crown. If you have enough of these you may get slight pressure at this point (indicating). If you put that kind of movement on this device, that tooth would lift the plate, and something is wrong with your technic.

Dr. Waldron.—No, not necessarily. You have a clasp go around the cuspid and bicuspid which will go into the model with a postitive snap. The proof of the pudding is in the eating. I have had these things happen, and Dr. Hawley has had them happen. It is due to that particular shape. I have never had it happen where the labial third of the tooth was in normal shape.

Dr. Barnes.—It is more important that the bicuspids should elongate than that the incisors shall go up.

Dr. Waldron.—The occlusion will not allow it.

Dr. Barnes.—The use of a biting plate progresses most satisfactorily wherever we obtain a bite. This (indicating) represents the planes of the upper and lower teeth. This method opens the bite and it later closes in the back. We do not get the result we think we get, and later if we take the plate out we have the overbite reestablished again. We corrected that in this way: We built into the plate a section of metal or rubber which reproduced the occlusal surfaces of the first molar in relation to the bite plane so that the amount of range at this point (indicating) was equalized by the rest here. The tooth here and there and the second molar are elongated. After that is established for a long time, your occlusion might become established. Later on, you can cut off the surface of this tooth and this lower tooth will elongate and you establish occlusion as it was. We have had considerable success in doing that.

We have later used that principle in another type of retention, and it is essential in opening the bite because you depend upon this part of the bite opening to sustain it by another area, so that instead of shortening the tooth you elongate this tooth. Your

metal opening must sustain the stress of mastication until the other teeth elongate, or your bite opening process it not a success.

The great difficulty with all these appliances depends upon whether you can trust your patients to wear them. After you have worked on a case for two or five years you want to be pretty sure you can trust a patient with a removable apparatus of this kind. You are putting your experience and your work into that patient's hands. If he can be trusted, all right. If he can not, don't use that kind of appliance. We find very often we can get adjustment in a local area which we could not get by these little labial wires, so that by cementing or soldering on little pins and little cross pins, you can put tension on a tooth which will check rotation or rotate it if you want that done. These little pins need not be made of heavy metal. They must not be very long, not over one-eighth of an inch. Even that is too long for certain cases. There must be some slight range of adjustment which must have slight tension, but they give you an adaptability greater than horizontal wire.

Dr. Waldron.—The great problem with all these appliances is whether you can trust your patients to wear them. After you have worked on a case for two or five years, you want to be pretty sure you can trust a patient with a removable apparatus of this kind. You are putting your experience and your work into that patient's hands. If he can be trusted, all right. If he cannot, do not use that kind of appliance. We find very often that we can get adjustment in a local area which we could not get by these little labial wires. By cementing or soldering on little pins and little cross pins, you can put tension on a tooth which will check rotation or rotate it if you want that done. These little pins need not be made of heavy metal. They must not be very long, not over one-eighth of an inch. Even that is too long for certain cases. There must be some slight range of adjustment which must have slight tension, but they give you an adaptability greater than horizontal wire.

Dr. C. A. Hawley (closing).—Dr. Waldron spoke of using these devices on deciduous teeth. I have not tried it because my whole energy has been fixed on the question of retaining a complete denture.

Dr. Abell asked about the mobility of the anterior teeth. My impression is that the anterior teeth are less restricted and more mobile. At any period practically all stress is removed from the anterior teeth.

So far as the correction of the overbite is concerned, I have found in my own experience no such difficulty as Dr. Barnes has described. I do not know that I could describe just exactly what takes place in such cases. My idea is that the bicuspids and molars move down bodily to complete occlusion and the alveolus and soft tissues of the mouth with them, but later there is reciprocal adjustment of both the anterior and posterior teeth.

The small pins Dr. Barnes spoke of, soldered to the bar, in my experience are unnecessary. I am giving you my experience; I am not at all arbitrary about it, but I have not found these pins necessary.

Dr. Barnes says he has had troubled with rubber plates irritating the soft tissues. You may have that trouble with a rough porous plate. I emphasized in the paper the desirability of vulcanizing the plates on a heavy tinfoil which produces a hard smooth surface which is not irritating.

The most important objection to a removable retainer is the question of the patient's losing it. I have put in something over two hundred. I have had three patients who lost their plates. In one case a girl called me up saying that she was going away to a boarding school. She called me an hour before her train was to start, stating that she lost her plate. She went off and came back four months later, saying she had found it about three weeks afterward, and the teeth were all right. Another patient, a young man in the army, lost his plate last June, and I have not seen him since. Another boy going to school sixty miles from Washington lost his plate, came into the office the next Saturday. I took an impression, and the following Saturday put in the plate, and all went well.

I would rather make each patient five of these plates to guard against loss than to leave them with fixed retention.

My experience has been that there is less irritation of the soft tissues and less injury to the teeth with these removable retainers, than there is with fixed retention. The patients will occasionally lose a plate; there is no question about that, and there will be some cases in which the soft tissues are injured by any retainer, and all retention has objections. If we could make our corrections and take off our appliances and dismiss the patient, and the teeth stay exactly where we place them, that would be ideal, but we know they will not and there is no retention that does not have certain objections.

There is one feature of this retention that I do not know whether you fully grasp or not, and I bring that out by asking you this question. Is there a man here who can tell me how long any case needs retention? Can any of you with the longest experience tell within three months of the time a case will need retention? I do not believe there is one of you who can do it. What do we do? We put in a retainer and guess at it. We get the patient to wear it as long as we can and in two or three years we take it off. Do these teeth stay? They do not in most cases. It may not be serious enough to take up the case again and re-treat it. But suppose you do take it, as I have done, and treat it again. Do you know any more the second time than you did the first?

The most important question is: Can you retain a tooth from rotation with a removable retainer? I know you can, and you have something there that relieves the patient also from the appearance of a fixed retainer. They can keep them for years. You can abandon it whenever you please. You can take off the retainer for a certain time, but you have a check against adverse movement for many years.

Here is another advantage. Some patients, many of them, want to appear, at least for a few hours, without anything on their teeth, and the removable retainer is a source of great relief to them. I have had a number of patients say to me: "If you can regulate my teeth and can retain them so that I can once in a while appear without any bands on the teeth, I am willing to have it done.

Dr. F. M. Casto.—I was a little suspicious that these plates might have a deleterious effect on the soft tissues, and those suspicions have been confirmed, because I have noticed in the examination of this model that there has been a great change in the tissue. I do not know how long this appliance has been worn. I would like to have Dr. Hawley explain the changes that have taken place.

Dr. Hawley.—It is one of Dr. Waldron's models, not mine, so I will pass it around. (Laughter.)

THE INDIVIDUAL NORMAL—THE PROBLEM OF ORTHODONTIA*

By A. LeRoy Johnson, D.M.D., Springfield, Mass.

THE growth of a science is due to an accumulation of facts. No opinions, beliefs, or convictions, even though advanced by men otherwise highly deserving, can take the place of real and sufficient evidence. At times, science progresses by flashes of intuition, yet more often, its progress is due to the patient and careful unveiling of facts by systematic research. Clinical experience, based upon rather indefinite doctrine, has carried us far enough to put beyond doubt the value and need of orthodontic treatment to many individuals; nevertheless, if orthodontia is to grow and become of practical service to humanity, it will be the result of scientific investigations of actual conditions, research which follows the truth wherever it may lead.

We have been attempting to build a science upon an ideal. An ideal scheme of the occlusal relations of the teeth we have called "normal occlusion." Such a conception as this has been the basis of our diagnosis and treatment; in fact, at the present time, it is finding expression in the endeavor to solve the problem of the correction of malocclusion of the teeth by means of a mathematical formula. However, though the developments of the future establish the value of mathematical analysis as a step in diagnosis, a conception of the problem of orthodontia as purely a mechanistic one is without scientific justification. It is for the purpose of defining the normal and indicating the way to approach the question of malocclusion of the teeth of the human individual that the considerations of this essay are presented. The subject matter treats of a problem of so fundamental a character that it seems advisable to present briefly the conception of the nature and purpose of orthodontia which has resulted in the seemingly unorthodox point of view.

The concept of the normal dental arch is the foundation of modern dentistry. Although the dental arch is often referred to as being composed of the teeth and their supporting structures, a dogmatic definition of it does not convey a true idea of the nature of the conditions which surround all dental operations. The concept of the dental arch is not limited to a study of the morphologic characteristics of the teeth together with their supporting and surrounding structures; it is more comprehensive. It is a concept derived from a study of the action, reaction, and interaction of different elements of the dental arch in the continual adjustment of life; it is a concept of the nature of living tissues as they stand in physiologic correlation. The structural elements of the teeth; the osseous, nervous, vascular and muscle tissues of the face and jaws intermingle and blend into one another and are controlled in their mutual relations by the more dominant influence of factors involving the entire organism. The line of demarcation between the dental arch and the other tissues of the living organism is not definite. Living tissues blend through an intermingling of structural elements,

*Read before the Nineteenth Annual Meeting of the American Society of Orthodontists, St. Louis, Mo., March 10, 11, 12, 1919.

while the central nervous system and the circulatory system, the avenue of the internal secretions, maintain the fundamental unity of the organism as a whole. The purpose of dentistry is to assist in establishing and maintaining the normal functional activity of the living dental arch. Hence the ultimate success of dental operations is not determined by their relation to tooth structure alone. All work upon or within the teeth involves living tissues which stand in physiologic correlation with other tissues of the living organism.

Orthodontia is ordinarily defined as "that science which has for its object the correction of malocclusion of the teeth."[1] Such a definition is of little value because it does not convey an idea of the nature of the problem involved in the correction of malocclusion. We believe it to be nearer the truth to define orthodontia as that branch of dentistry which treats of the forces controlling the form of the dental arch. This indicates in a general way, at least, the extent of the phenomena to be considered in diagnosis and treatment. The form of an organ or part is the result of an interaction of forces; it is the result of the interaction of function and structure. Structural form can not be accounted for by environmental factors alone, neither can heredity explain away all variation. It is the interaction of one with the other, the combined influence of the extrinsic with the intrinsic which determine the form of structures. Therefore the subject matter of the science of orthodontia is derived from the two phases of biology, heredity and environment, and is, in the main, a study of the fundamental truths and laws of science as they are expressed in the growth and development of the dental arch of the living human being; and the relation of these truths and laws to specific abnormal structural conditions. Orthodontia is essentially a science of form development.

From such a standpoint as this, the field of orthodontia broadens beyond a study of occlusion. Inasmuch as the teeth are the primary factors in the evolution of the dental arch, and the principle function for which they exist lies in the physical relations of their crowns, the study of occlusion constitutes a large part of the science. It is, in a degree, an index of the developmental condition of the adjacent structures of the teeth and a register of the forces acting upon them.

Orthodontia is concerned with a collection of structures of different origin, varying in developmental nature, reacting to different influences, yet organized for a common purpose. The occlusal relations of the teeth constitute but one element of a complex of structures interdependent in life, and subordinate in evolution to the organism as a whole. Nowhere in the living organism is there an instance wherein parts of such diverse character are more closely associated or more dependent upon each other than in the dental arch, and it is the purpose of orthodontia to so treat these diverse elements, directly or indirectly, that they will express, individually and collectively, the normal development of the individual organism.

The difference in the developmental nature of the teeth and adjacent structures is a characteristic of the dental arch most significant in the study of malocclusion. Enamel is derived from the ectoderm, while muscle and connective tissue structures are derived from the mesoderm. The dental bulbs appear as shallow inverted cups and beneath their centers is found the condensed connec-

tive tissue which gives rise to the body of the tooth, the dentine. The primitive dental bulb is projected directly into the embryonic connective tissue, which underlies and covers the tooth band on all its free surfaces.[2] Ectodermal epithelium pushes into the embryonic connective tissue and the enamel organs thus formed are of such a different nature and are susceptible to such an entirely different set of influences that they mark the slightest variation in the development of the connective tissue structures. The crowns of the teeth are completely developed in adult form long before they function in mastication and in use they wear away, while bone, muscle, vascular and nervous tissues depend for their complete development upon the stimuli of function. This wide difference in the developmental characteristics of the tissues which compose it, make variations in the form of the dental arch more obvious than in other parts of the organism where the tissues are more nearly of like nature. For this reason a scientific interpretation of the normal is more essential in orthodontia than in other fields of orthopedia where the structures are, in a greater degree, molded and harmonized by function in the ordinary activities of life. In fact, the fundamental problem in orthodontia is to determine the normal dental arch of the individual organism. It is a problem of the individual as distinguished from class, group, or species and as such is inseparably linked with the phenomena of variation.

The most obvious thing about the individual organism is its variability.[3] Variation in form and function is universal among living beings. Although two individuals will resemble each other, possessing certain characters in common, yet invariably upon close examination these characters will be found to differ from each other in degree or in proportion. Differences extend to minute particulars and include all characters, function as well as structure, internal organs and parts as well as external proportions. No part of the living being escapes the influence of the law of variation. Hence an interpretation of the normal as it refers to the dental arch of the individual organism must find a basis in this law and must be determined by the methods employed in the analysis of the material relative to it.

The question of the normal has been handled as though it were only a problem of species. The attempt has been made to establish an imaginary line, called the "line of occlusion," as a criterion by which to determine the existence or nonexistence of malocclusion and deformities of the dental arch.[4] Twenty years or more have passed since Dr. Edward H. Angle first defined the line of occlusion, yet for many the question of the normal is still unanswered. In owning that it is so, we do not honor Angle's work the less, for whatever value the future may assign to the line of occlusion in diagnosis, it will always be remembered that it was through the work of Dr. Angle that the problem of malocclusion was first studied as a problem of science. If he did not solve the question of the normal in his early writings, he gave the hope of its solution, undoubtedly, a greater thing.

The endeavor to utilize the line of occlusion as a standard by which to determine the normal involves a contradiction. As has already been emphasized, orthodontia is concerned with the dental arch of the individual organism while the line of occlusion is based upon a consideration of type. The contradiction lies in the assumption of an individual type.

Type is a word that has been used very loosely, but literally interpreted, it refers to a general form or plan of structure common to a number of individuals. It is the ideal representation of, or the most perfect exemplification of, a natural group. It is a composite of individual forms. An individual is not referred to as a class, neither is an individual a type, in either case the individual is but a unit in the composition of a class or type. I quote from Davenport[5] a concrete case which will best illustrate the principle involved. "A random sample of Leaming corn, consisting of 327 ears gave the distribution as to length as illustrated in Fig. 1. It will be noted at once that there are more ears of 9 inches than of any other length, and that the distribution decreases in both directions, but unequally, from this highest frequency. This highest frequency, or most common length, shows clearly what is the prevailing type as to length in the crop, and it is held by statisticians to be the best obtainable expression for type. When it is ascertained, therefore, we know at once what is the natural type of the race or variety so far as the character in question is concerned, and when this is determined for a number of important characters we shall have

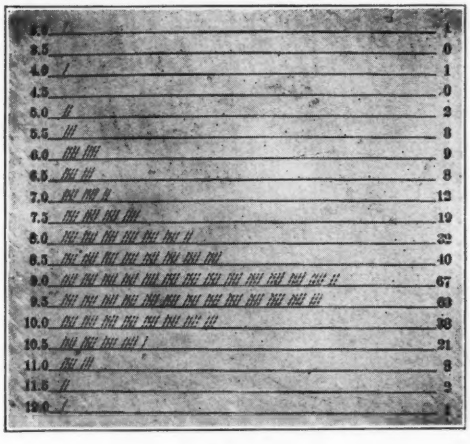


Fig. 1.

a good knowledge of the racial type as a whole. But in obtaining the mode of another character as circumference or weight, the ears tabulated as typical will not necessarily be the same as those which constitute the group of highest frequency in a study of length." Consequently, "while we might obtain the mode of the circumference, number of rows, weight of ear, or any other desired character, and having done so are able to describe definitely a typical ear," it should be clear that the typical is not a concrete thing, existing in natural form, but is of the nature of an abstraction, a model or pattern from which the individual presents some degree of variation. The word type used with individual refers to certain marked racial characteristics which the individual possesses. It directs attention to certain traits or features which are common to different individuals. It can not in any sense apply to the individual as a specific standard of normality, for there is a great range of individual variation without departure from type.[6]

Furthermore, the concept of the line of occlusion embodies the idea of the teleologists who believed that normal organs and parts express the most per-

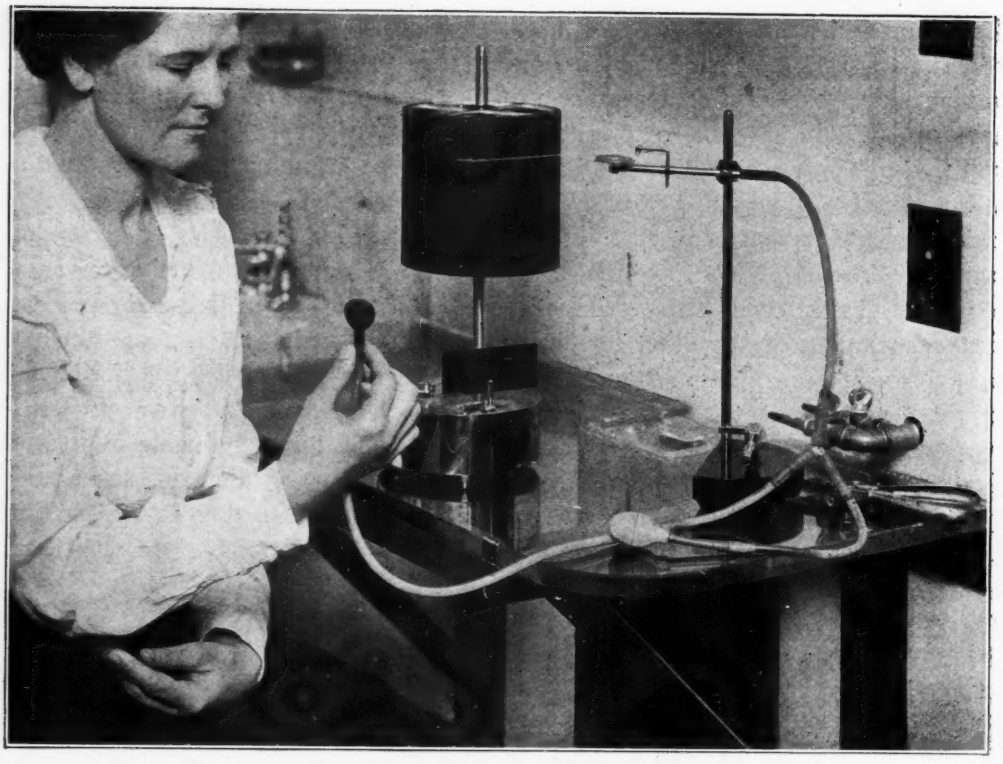


Fig. 2.

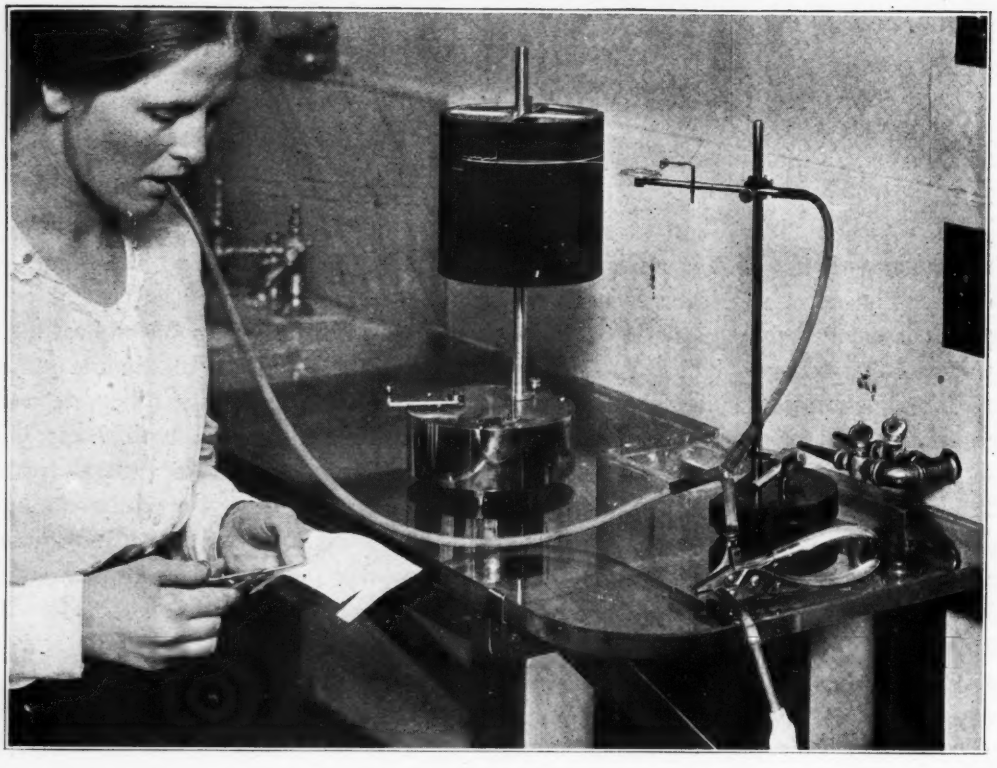


Fig. 3.

fect means of performing the function for which they exist. This theory has long since been adandoned. Huxley says that teleology, as commonly understood, received its death-blow at Darwin's hands.[7] Darwin simply affirmed that organs and parts work well enough to enable an animal to survive, but admitted the possibility of improvement in their form and function, and his opinion holds true today.

Therefore in the face of constant variation and incompleteness, it is evident that the normal as it applies to the individual organism can not be deter-

Fig. 4.

Fig. 5.

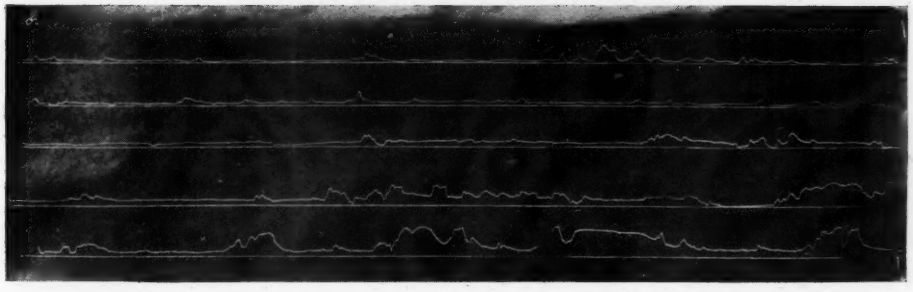


Fig. 6.

mined by a study of type taken of itself alone or of structural perfection. If the typical is utilized as a definite standard of normality of the individual and all variations from it classified as abnormal then the normal individual does not exist. It is not reasonable to base our diagnosis upon a concept which can never be realized in natural forms.

The scheme of occlusion expressed in the ideal relations of the inclined planes of the cusps of the teeth is a working hypothesis; it is a theory to be adopted as a guide in an investigation of the real nature of occlusion. A hy-

pothesis is not proved; it is assumed to account for a fact or an occurrence. If you were to determine the ingredients of a chemical compound, a general knowledge of its kind or character would decide the methods to be employed, and each succeeding process would be the result of an assumption or theory that such pro-

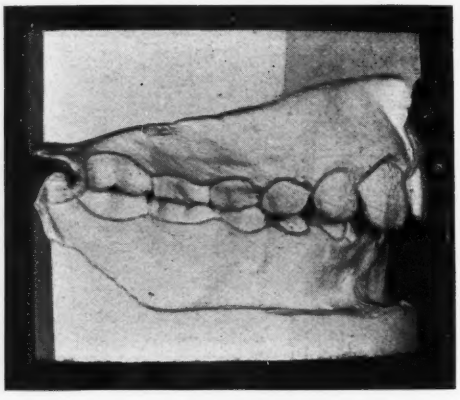


Fig. 7.

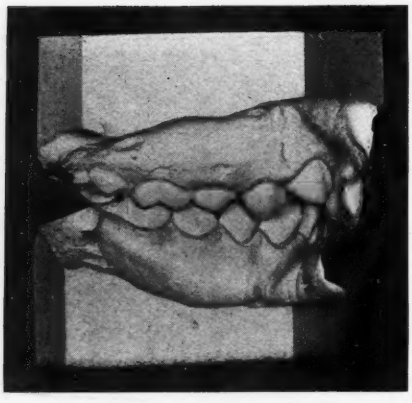


Fig. 8.

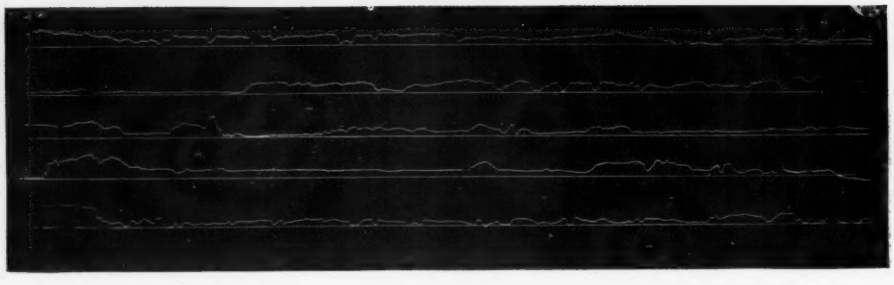


Fig. 9.

cedure would reveal one or more of the constituent elements of the compound. In other words, in chemical analysis a theory which has a basis in fact, is the assumption, the belief, the hypothesis which leads to the investigation that reveals the real nature of the phenomena in question. A hypothesis leads to facts; it does not express actual conditions already established. The ideal scheme of occlusal

relations commonly called "normal occlusion" is a concept derived from a study of the law of occlusion, and is the mental picture, the working hypothesis, essential in an investigation of the nature of occlusion, as it is in the mouths of men today. Such a concept furnishes the groundwork for a study of the facts, the real evidence which constitutes so vital a part of the subject matter of orthodontia.

Fig. 11.

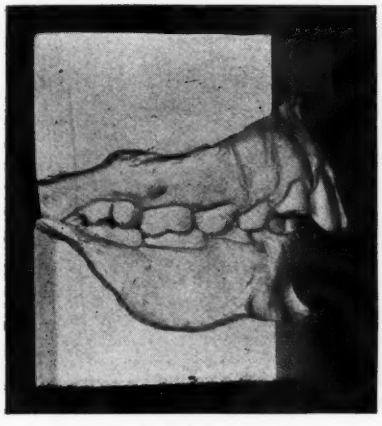


Fig. 10.

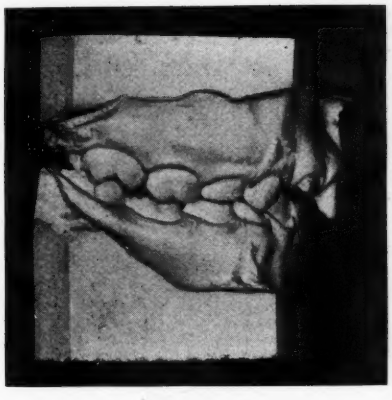


Fig. 12.

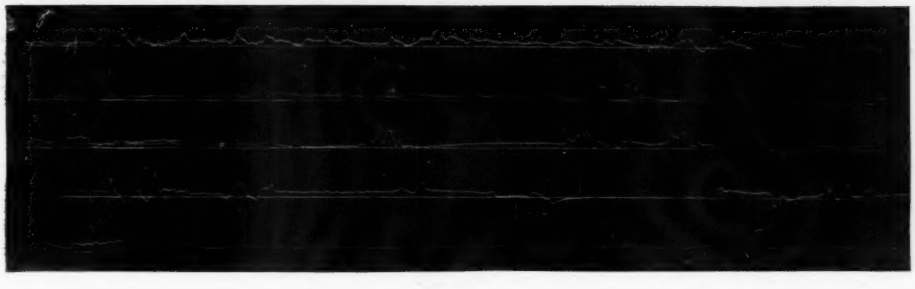


Fig. 13.

The word "normal" means a resultant of correlated factors. As it is used in orthodontia, it refers to either one of two classes of phenomena; either to the general form of a character as seen in a group of individuals or to a complex of the individual organism. The former signifies a correlation expressing the typical form of an organ or part as seen in many individuals; the latter

signifies a correlation which is best suited to the life activities of the individual organism as a whole. Hence, in the study of occlusion then we are concerned with two groups of phenomena, the *species normal* and the *individual normal.*

The species normal is a concept derived from the observation and comparison of the occlusal relations of the teeth of many organisms. It is the result of combining, of bringing together in one concept a variety of structural con-

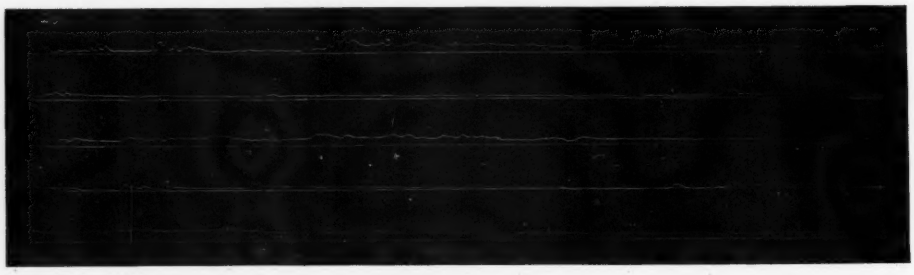


Fig. 15.

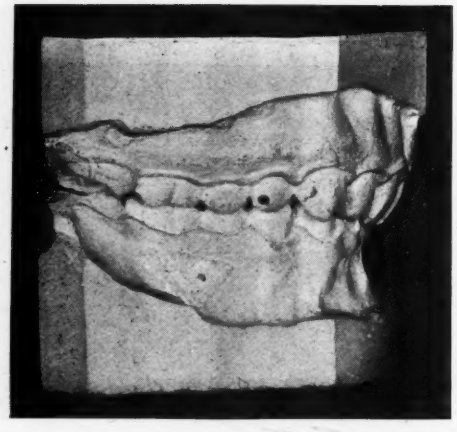


Fig. 14.

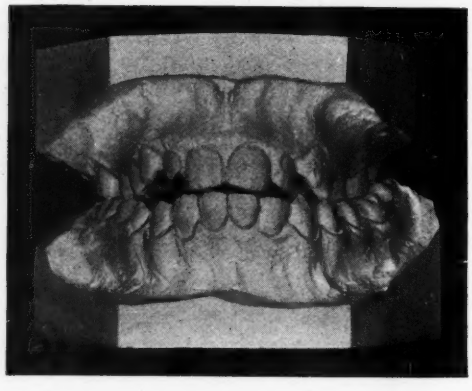


Fig. 16.

Fig. 17.

ditions, each different from the other, no two alike, as illustrated in the study of the typical ear of corn. The species normal might be considered as a composite of the occlusal relations of the teeth of many organisms. If it were possible to make a composite photograph of the occlusal relations of the teeth of a group of individuals from all angles, the result would portray the typical occlusion, the species normal.

The word "normal" in the phrase "species normal" refers to the resultant of a correlation of structural conditions. In much the same sense, R. E. Lloyd[8] uses the word "normal" as the majority. The word "species" is chosen for its literal sense. Although it is often used to designate an aggregate of individuals, varying around a normal type, such is not the strict interpretation of the word. Many species that were once thought to be distinct from one another have later

Fig. 19.

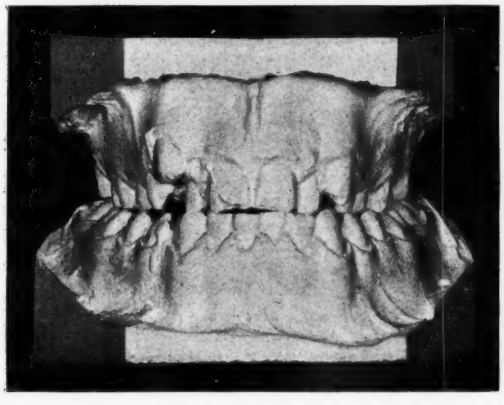


Fig. 18.

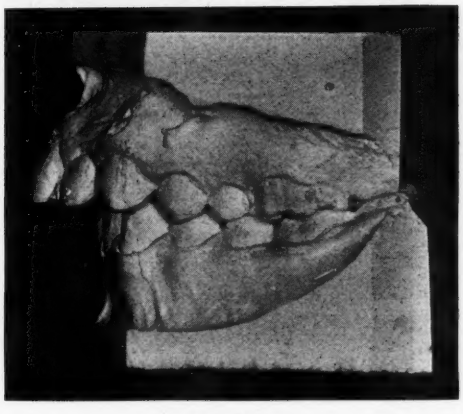


Fig. 20.

Fig. 21.

been united by the discovery of intermediate forms. Perhaps the most notable instance illustrating the arbitrary character of the grouping of the species, is where two animals which were at one time classed as belonging to different species were later proved to be male and female of the same. Of course, it is true that at a given time, the forms of living things may be arranged in specific groups, and between the immense majority of these there are at the present

time no transitional forms. However, we know from the law of variation that even the characters which determine the grouping together of certain individuals are not identical but vary in some degree, in some way from each other. It is with these variations that we are concerned in orthodontia. In its most literal translation, species means an abstract form, an abstract condition of occlusion, if you will, around which a group of variations oscillate.[8] It is in this sense

Fig. 23.

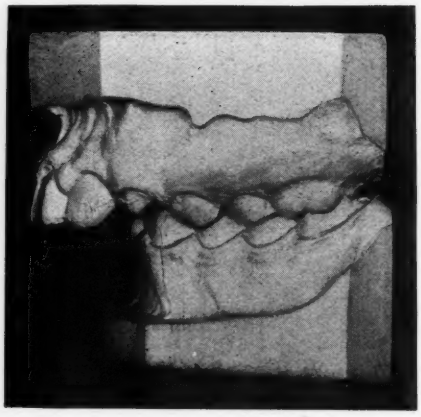


Fig. 22.

Fig. 24.

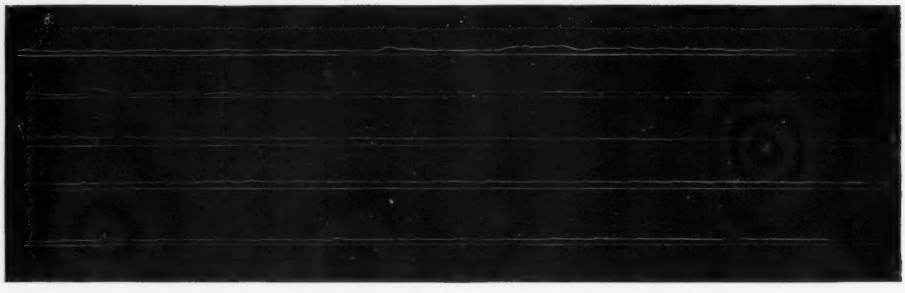


Fig. 25.

that it is used in the phrase "species normal." It seems better to convey the idea of the typical in this way than to employ the "collective normal" of the psychologist. Species although used synonymously with typical seems preferable as it contrasts more clearly with individual.

The "individual normal" is the result of the correlated activity of many parts of the individual organism.[10] It is the result of a complex of physiologic

processes. The Individual Normal refers to the form of occlusion best adapted to the needs of the organism as a whole. It refers to the condition of occlusal relations which is the most effective in maintaining in its most stable form the equilibrium expressed in the life phenomena of the individual organism. It may or may not approximate the species normal. It is not an artificial creation built upon an ideal plan. It is the most perfect condition of occlusion that the

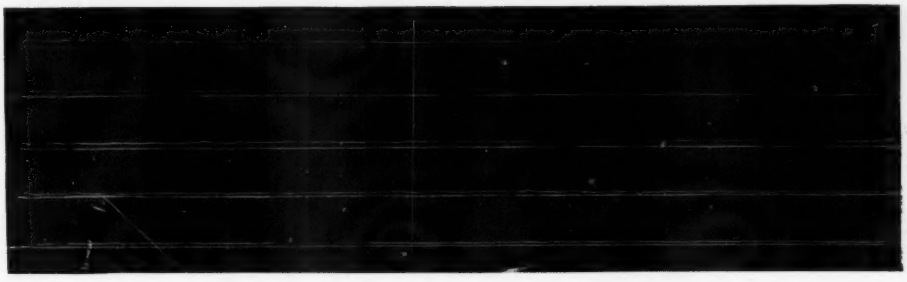


Fig. 27.

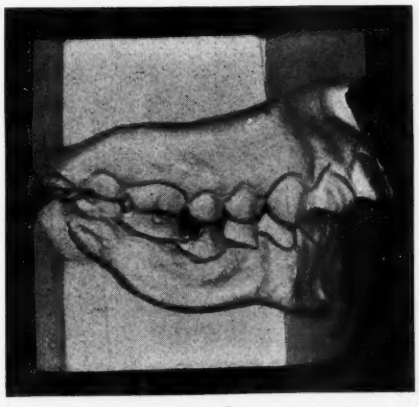


Fig. 26.

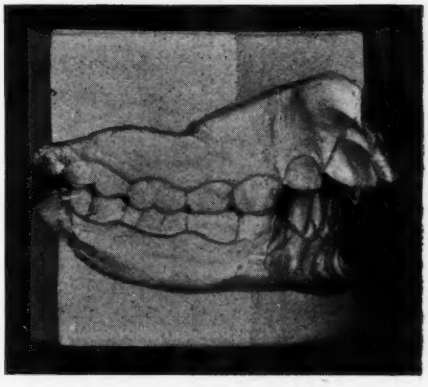


Fig. 28.

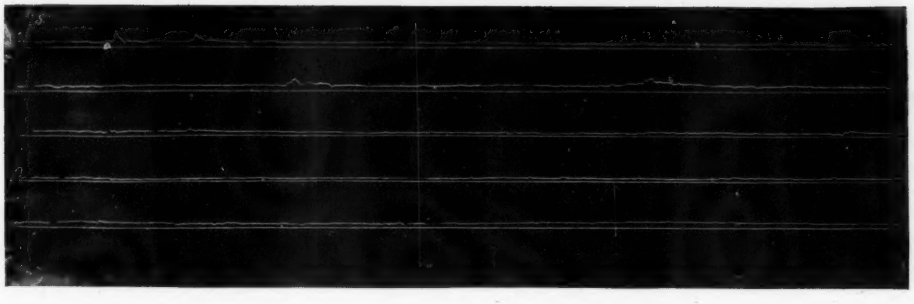


Fig. 29.

nature of the tissues and the functional activities of the organism as a whole will permit.

The dental arch is a mobile equilibrium reflecting the inheritance and life activities of the individual organism as a whole. To know when the form of a dental arch is normal for a particular individual is a difficult problem, and its solution, which is so vital to orthodontia, involves a consideration of the funda-

mental principles and laws of science. There is no short cut to a solution of the problem of deformities of the dental arch.

A science in its growth passes successively through the speculative, the qualitative, the quantitative, to the predictive stages of development.[11] As a result of speculation, qualitative work is done, and from the general principles thus established, quantitative methods can be evolved which, in a varying degree, will make prediction possible. Much qualitative work is necessary in orthodontia before it can lay claim to quantitative methods of procedure. A statistical study to ascertain the typical occlusion, the species normal, of man is yet to be done. Although a most perfect occlusal relation may have been born into the race, we do not know enough of the true nature of occlusion as it is today. Of course such an investigation would be a difficult and tedious task. In fact

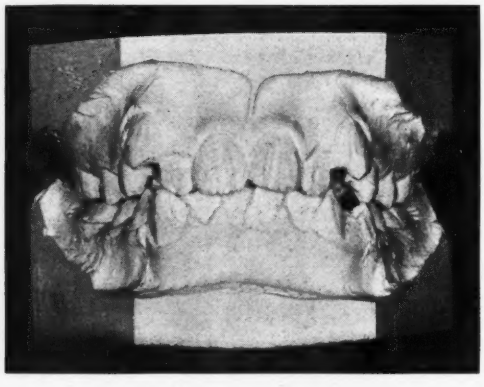


Fig. 30.

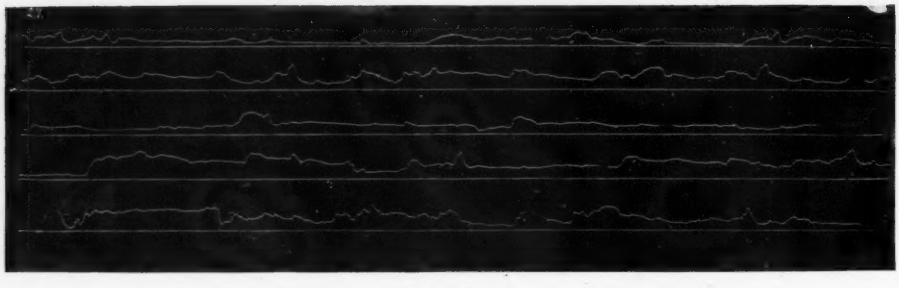


Fig. 31.

it is futile to suppose a very fine degree of accuracy in recording observations of this nature. Yet research of this kind is one of the first essentials in establishing orthodontia in science. General principles derived from studies of groups and species are indispensable in a study of the individual organism. They are indices to individual characters.

Much of the evidence in the following illustrations is still obscure. The studies of it have not been carried far enough to establish its full value. Yet certain tendencies are sufficiently clear to justify a preliminary report. No further claim is made than that the evidence in its present form points to a correlation of a physiologic nature and indicates one of many ways to approach the question of the individual normal. The study is of involuntary tongue movements.

The apparatus used is patterned after that of E. W. Scripture in his work on Stuttering and Lisping.[12] It consists of a kymograph and tambour which is connected by rubber tubing with a very delicate rubber bulb (Fig. 2). The bulb is inflated by forcing air through the auxiliary tube. When this is done, the recording needle is raised as shown on the drum. With the patient holding the tube in the hand a base line is recorded upon the smoked paper. Then the end of the tube is held firmly between the incisor teeth, placing the bulb between the tongue and the hard palate. The patient is told to allow the tongue to rest against the bulb, and the following tests are made, each one being preceded by marking the base line and all are of one minute duration: First, subject sitting still looking out of window; second, reading to himself; third, cutting figure out of paper as seen in Fig. 3; fourth, writing verse of song with pencil upon back of paper; fifth, repetition of first. Approximately two hundred charts have been made. Figs. 4, 5, and 6 will give an idea of the variations met with. From the anatomic structure of the tongue and its involuntary character, an irregular line might well be anticipated. But the difference in the character of the lines and the relation of this difference to the structure of the dental arch is at least significant. The charts were classified according to their general character, without consideration of sex and very little regard to age. Of course the class distinctions were not absolute, there being transitional records in all instances. However, certain things were evident. The majority of the charts of patients with the overbite form of malocclusion were in the same class. They were characterized by an irregular tongue line which dropped to and often below the base line. While this was not seen in all of the cases that, from a study of occlusion alone, would be classed as overbite cases, it has not as yet occurred where other forms of malocclusion were present.

Fig. 7 is malocclusion associated with Fig. 5; Fig. 8, malocclusion associated with Fig. 9; Fig. 10, malocclusion associated with Fig. 11; Fig. 12, malocclusion associated with Fig. 13; Fig. 14, malocclusion associated with Fig. 15. The last case is particularly interesting in its similarity to the others from the fact that the patient is from six to eight years older.

The open bite cases and those with the relatively short overbite show the tongue line well above the base line.

Fig. 16 is malocclusion associated with Fig. 17; Fig. 18, malocclusion associated with Fig. 19; Fig. 20, malocclusion with Fig. 21; Fig. 22, malocclusion associated with Fig. 23.

The cases illustrated in Figs. 20 and 22 have responded to treatment without difficulty, while Figs. 8 and 10 are quite different. The teeth move easily but there is a constant tendency to relapse.

Fig. 24 is malocclusion associated with Fig. 25; Fig. 26, malocclusion associated with Fig. 27; Fig. 28, malocclusion associated with Fig. 29; Fig. 30, malocclusion associated with Fig. 31.

Note rhythm in the tongue line of Figs. 24, 26, 28 and 30. In each of the first three cases the incisors would push forward unless appliances were worn intermittently. It will be obvious to many that the absence of a gauge to register the pressure of air in the rubber bulb admits an element of error in the records. This is, of course, also true of the condition of the rubber on the tambour and

bulb. But recognizing all this, the fact is that the rhythm evident in these three charts was not seen in any of the others. What further study will reveal I can not say.

Fig. 30 is associated with Fig. 31 which is a chart of a boy with chorea manifest in the superficial muscles around the orbits.

BIBLIOGRAPHY

[1]Angle, Edward H.: Malocclusion of the Teeth, ed. 7.
[2]Jordan and Ferguson: Textbook of Histology.
[3]Bateson, William: Material for the Study of Variation.
[4]Angle, Edward H.: Malocclusion of the Teeth, ed. 7.
[5]Davenport, E.: Principles of Breeding.
[6]Piersol, E. A.: Human Anatomy.
[7]Huxley, Thomas: Criticisms on "The Origin of Species."
[8]Lloyd, R. E.: Growth of Groups in the Animal Kingdom.
[9]Encyclopedia Britannica.
[10]Conklin, E. G.: Heredity and Environment.
[11]Johnson, A. L.: Items of Interest, 1918.
[12]Scripture, E. W.: Stuttering and Lisping.

DISCUSSION

Dr. John V. Mershon, Philadelphia, Pa.—After reading Dr. Johnson's paper many times, I feel that it is a mistake to discuss it. I consider it so near a perfect presentation of facts that to add to it would be impossible, so my remarks should not be considered a discussion. I am only going to call your attention to some facts and emphasize what seem to me to be very important.

The whole trend of Dr. Johnson's paper is to show that we have been undertaking to work an ideal which does not exist, that is our past conception of the ideal normal occlusion, and he has given us the correct standard to which we can work, and a basis on which to start to study. The study of the individual normal must be measured by the functional activities of the forces of development. Dr. Johnson has very properly called our attention to the fact that the orthodontist can no longer depend on the morphologic characteristics of the teeth, and their supporting and surrounding tissues, but that we are dealing with a portion of the human being, and that the mouth and all the organs which compose the oral cavity are just as much a part and parcel of the human being as the lungs, the liver or any of the other organs, and are affected by the internal conditions both in its growth and development, and we must treat the individual as a whole.

Dr. Johnson's definition of orthodontia is a great improvement over anything we have had previously, he defines it as that department of dentistry which treats of the forces controlling the form of the dental arch. Later on in the paper Dr. Johnson, in referring to normal variations, states that these variations are not confined to the osseous tissues in which the teeth are located. We have the same variation in the form and size of the teeth, as nearly all tissue form depends on function. The teeth are formed before they begin to perform the function for which they were originally designed. These facts would seem to prove conclusively the fallacy of undertaking to predetermine the size and shape of the dental arch purely by measuring the tooth material, and entirely disregarding the forces which operate through function to produce form.

Dr. Johnson has also shown us that arch form is of the individual normal. It would be interesting in studying these slides which Dr. Johnson has been showing, if we could have an analysis of the individuals from which these records were made, as to what deformities may exist in the other parts of the body. The story told by these slides seems to be very closely related to the work done by Dr. Johnson and Dr. Hatfield on muscle development. In their investigations they showed the relationship between the lowered muscle tone and bad osseous development. These records which Dr. Johnson has been showing are another connecting link between a certain type of osseous deformity represented by a certain type of malocclusion which expresses itself indirectly through the nerv-

ous system by the way of the involuntary muscle fibers in the tongue which are responsible for the variations shown on the records. In both of these investigations it simply goes to prove that malocclusion is only a local expression of a general constitutional condition. The result of these investigations should further impress us with the facts that orthodontic appliances are not the only prescription necessary in the treatment of malocclusion. A great deal more importance should be attached to the value of these investigations than Dr. Johnson seems willing to admit. I think this society should be congratulated that we have men who are willing to spend the time and energy necessary to make these investigations and give them to us absolutely free, such as Dr. Johnson has been doing this year and last year.

Dr. William C. Fisher, New York City.—I find there is very little left for me to say after the paper of Dr. Johnson and the discussion of Dr. Mershon.

Dr. Kemple said that Dr. Johnson wanted me to discuss his paper. He spoke to me at a meeting of the Academy of Medicine in New York about it, and I thought he was poking fun at me, and I so told him, and I still believe so. After I had read the paper, I did not believe Dr. Johnson wanted me to discuss it. Dr. Johnson and I had dinner together and during that dinner he outlined the salient features of his paper to me and showed me some of these slides.

His paper is a little different from the one he gave me. "If the typical is utilized as a definite standard of normality of the individual, and all variations from it are classified as abnormal, then the normal individual does not exist." That is the meat of that particular part of his paper. Typical and normal do not *mean* the same thing; they can not *mean* the same thing and they can not *be* the same thing, but unfortunately many have frequently confused them into *meaning the same thing.*

Dr. Johnson spoke of the influence of heredity. How many of us, when our little patients come in, make concrete models and immediately base our diagnosis on them, outline the appliance to be used, have it made, and put it back on the patient? And that is as far as we have gone in our diagnosis. How many of us look into the antecedents of the child, and how many of us think what the normal for that child should be? Nine times out of ten even the most conscientious of us have unconsciously in our mind's eye the so-called normal arch type, and we do not consider the child. This leads to the point I would like to bring out which I get from his paper, namely: How will this affect our work? That is what we want to get out of all papers presented here. What difference will it make in our treatment of cases? To me it has a very important bearing on the treatment of malocclusions of the deciduous teeth.

I was asked the question in this meeting recently, "What would be your treatment of a child between five and six years of age where there is pronounced malocclusion?" My answer was that in the majority of cases I would condemn the orthodontist. I do not believe that we are warranted in interfering with many of the deciduous maformations for the reasons brought out in Dr. Johnson's paper—study the individual normal. We can not possibly tell exactly and know in what direction a child will develop, what the normal of that child can be, later when seen at the age of four or five years. The parents and the relatives of a baby at the first and second year will tell you and admit to you that the child is a living image of the mother. By the time that child reaches five or six years of age it is so absolutely changed in its appearance that it may resemble the father and have no resemblance whatever to the mother. As time goes on and the child develops it may lose its resemblance to either one of the parents and may take on the resemblance of one of the grandparents. Changes occur in the families where you study the physiognomy of the children. With that point in mind, how can we determine the treatment of these deciduous cases? In my own practice I have for a long time confined orthodontic interference in malocclusion of the deciduous teeth to the expansion of the inferior cuspid region, and that only rarely.

To know the individual normal is to know your science. In other words, it can not be laid down by rule and compass, but can be realized only by years of experience.

Dr. B. E. Lischer, St. Louis, Missouri.—I hesitate to discuss this very interesting paper extemporaneously because it is a philosophical dissertation on fundamental problems.

Dr. Johnson made the statement in the first paragraph of his paper that if orthodontia is to be of practical service to humanity, we will have to study this subject. I would like to insert the word *more.* The fact that we are here today is proof that we have been of *some* value to humanity. That, however, is a minor criticism.

He has called our attention to the factor of *variation.* The study of variation, as I understand it, has led to the concept that *variations* are of *germinal origin;* they are congenital. But there is another subject in connection with this matter that requires out attention; namely, *modifications.* These are wrought in an individual's lifetime, are *somatogenic, or acquired.* Many modifications can be found in the facial features; I refer particularly to those due to the anomalies of dentition. And while I would not detract one iota from the imperious hypothesis of occlusion, I want to call your attention to the fact that we will shortly have to study in greater detail the facial modifications of our patients.

For several years I have taken life size photographs of the face of every patient that comes to my office, and I find these are of great value to me. I have reference particularly to the facial features that are involved in the orthodontic treatment, and I have been amazed at the many variations and modifications that we are confronted with. I am convinced that many of our preconceived theories will have to be exploded.

But as I have previously said, I am not prepared to discuss this paper as I should like to, and I want to thank Dr. Johnson for its very able presentation. It seems to me that it opens up tremendous possibilities.

Dr. Milo Hellman, New York City.—I shall discuss Dr. Johnson's paper, for it merits

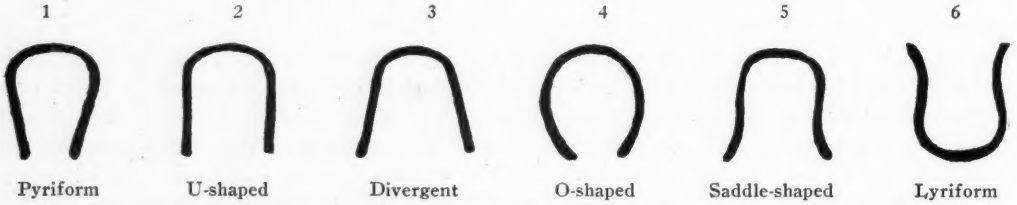


Fig. A.—Illustrating diagrammatically the various forms of the dental arches of the Anthropoid apes.

discussion. In doing so, however, I shall touch upon one point in order to bring out in a concrete form a suggestion Dr. Johnson has passed by so lightly. And that is the remarks made relative to the mathematical calculations employed as predetermining factors for the various dental arch forms.

If you will permit me to show one or two diagrams which I have used in connection with a paper read before the Alumni Society of the Dewey School of Orthodontia, I shall bring forward some comparative evidence bearing upon this topic.

If the contention is correct that the dimensions of the teeth will predetermine the form of the dental arch in man, the evidence obtained from comparative studies would verify it. With this end in view, I examined a number of anthropoid apes, comprising all the genera included in the family. These are the gibbon, the orang, the gorilla, and the chimpanzee. The skulls of the apes examined belong to the collections of the United States National Museum of Washington, D. C., and the American Museum of National History of New York. While the teeth of the anthropoids themselves bear a close resemblance in form to those of man, with the exception of the canines and lower first premolars, the arch forms differ considerably. However, the form of the dental arches may be classified under six main types. These are the pear-shaped, the inverted U-shape, the divergent-shape, the oval-shape, the saddle-shape and the lyre-shape. (See Fig. A.) Each dental arch in the anthropoid series must fall under one of these forms. But there are generic differences in the prevalence of arch form and the frequency of their appearance in each group. Thus, the gibbon presents the arch forms under 2, 3, 4, 5, 6; the orang, under 1, 2, 3, 4, 5; the gorilla, under 1, 2, 3, 5; the chimpanzee under 1, 2, 3, 5, 6. Moreover, each genus exhibits a preference for a certain type of arch form. In the gibbon, the upper arch form most frequently noted is the lyriform; appearing in 73 per cent of

cases. In the orang, the ypriform appears in 38.5 per cent; in the gorilla, the U-shaped form appears in 46.1 per cent and in the chimpanzee the lyriform appears in 40 per cent of cases.

If there is any relationship between the size of the teeth and the form of the arch we should find similar sized teeth in a particularly shaped arch. That is to say, if we take the 73 per cent of cases in the gibbon that fall into the lyriform arch, the central incisor of each of these cases should be of uniform size, or taking the combined dimension of all they should at least have a higher average than the central incisors of the cases belonging to all the combined other forms. This should be evident if there is any definite correlation. But actually it was not so. On measuring all central incisors belonging to the lyriform arch they were found to vary; and averaging their dimensions, it was also

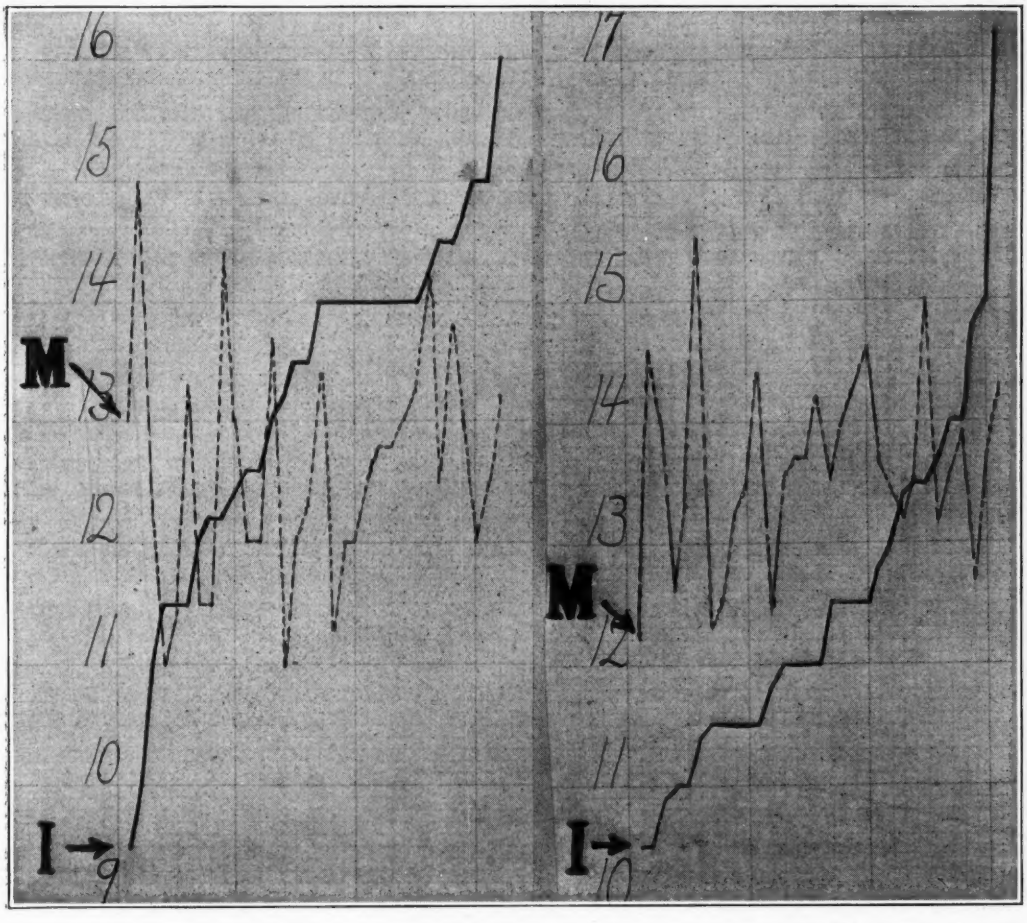


Fig. B. Fig. C.

Fig. B.—Illustrating the relationship of the mesiodistal diameter of the upper central incisor and upper first molar of each individual orang possessing the same arch form. *I* indicates the incisor curve, and *M*, the molar curve; showing no correlation whatever between these dimensions. Numbers indicate dimensions of the teeth in millimeters.

Fig. C.—Illustrating the labio-lingual relationship of the upper central incisor and first molar, worked out in the same manner as in Fig. B.

found that there was no difference in the average for the central incisors belonging to one particular arch form, for the combined forms of all the arches showed a similar average. The same test was made upon all the anthropoids and the conclusion reached is that the average dimension of the incisors belonging to one arch form is no higher than the average of the central incisors belonging to the different arch forms. It was then of interest to find out whether there is a correlation between the two dimensions of one tooth in a

particular arch form; that is, is there a correlation between the mesio-distal diameter and the labio-lingual diameter of the same tooth in the same arch form? There was found to be none. Is there a correlation between the mesio-distal diameter of two teeth in the same form of arch? That is, is the mesio-distal diameter of the central incisor and the mesio-distal diameter of the first molar of the same dental arch in correlation?

Fig. B illustrates a diagram which will convey the answer.

Taking for instance, the pear-shaped arch of the orang, the mesio-distal diameter of the central incisor varies in that one arch form in different individuals between 9 and 16 millimeters. That is all right. It has a right to vary. But if there be a correlation between the dimensions of this tooth and those of any other tooth the dimensions of the other tooth should vary accordingly. So on arranging the dimensions of the incisors varying between 9 and 16 millimeters according to size, the ascending curve in Fig. B, *I* was obtained. But on charting the molars belonging to each individual whose incisors are thus marked, as indicated by the vertical lines, the irregular curve as may be seen in Fig. B, *M* was obtained. While there is a gradual rise in the mesio-distal dimension of the incisor, the sizes of the molars fluctuate up and down showing that there is absolutely no relation between the two. A similar arrangement of the labio-lingual dimensions of the same teeth, as may be seen in Fig. C, produced no different results. This test was made on every arch form of the various genera the result not changing at all. These records undoubtedly show the sort of correlation existing between dimensions of the teeth and of the form of the arch, thus having a concrete bearing upon a few of the points referred to by the essayist.

With relation to the charts of Dr. Johnson, he suggested that we should not pay any attention to them. To my mind they are very indicative, and I do not hesitate to say so.

I have been intensely interested in the study of the etiology of malocclusions for the last five or six years, and have made many studies and charted a good many cases to find something of value. I have published several papers on the subject, and the last contribution I made was based on the general disturbances of the individual in their relation to malocclusion. In the various studies I have found that there is a considerable correlation between malocclusion of the teeth and malnutrition of the individual in early infancy. Also subsequent disease processes, due not only to artificial feeding, but also to various conditions associated with disturbances that bring about artificial feeding are found to be correlated with occlusal anomalies. I would therefore be very much interested to know whether Dr. Johnson has made any examinations into the past history of the cases of malocclusion from which he has obtained these charts, because I feel that in some cases, like children who have suffered from exudative diathesis, there are certain defects which they probably never overcome. These defects would give expression in some sort of curve which may be indicative of some particular disturbance or disturbances in infancy.

Dr. V. E. Barnes, Cleveland, Ohio.—We should regard these arch forms as an expression of deformity rather than of normality. We may differ as to normal development. The development which we find in children of five or six years of age is in the majority of cases an expression of abnormal or deficient development, for the reason that in the Caucasian races we have a history of malnutrition, of insufficient nourishment due to artificial feeding. As I pointed out in a paper presented in 1912, we must not take those cases which come to us as normals. If a patient succumbs before maturity we may express that case generally as an abnormality. We must look at the case at first, not as normal, but as abnormal. Until it is a part of the normal we accept with considerable question the normal and abnormal. The types should be taken as expressions of deviations from the ideal. I do not know that we can calculate a perfectly normal arch. I do think, however, we can mathematically calculate an arch from the size of the tooth given us, and that is our limit, the zero measuring point from which we may later calculate deviations if they are constantly determined.

I have not had enough time to digest Dr. Johnson's paper, but I think he has tried to prove that the individual normal may be expressed in the malpositions of the teeth as we find them in that individual.

Dr. W. H. Gilpatric, Boston, Mass.—I did not intend to bring up the subject that I am about to refer to, but inasmuch as Dr. Hellman and Dr. Johnson led up to the predetermination of the dental arch to a certain extent, I shall refer to it.

Dr. Hellman spoke of apes. We as orthodontists are not today dealing with apes. He also spoke in regard to measuring one central incisor and predetermining the arch from it. I do not believe that can be done.

In the past two years and a half I have been working on the predetermination of the dental arch, and, as I understand and construe Dr. Johnson's paper, the individual normal arch. Nature has given us a certain tooth substance; we have not selected it for that individual case, and if patients come to us with these abnormalities, what are we going to do?

If you have 85 millimeters of tooth substance in the case of Johnny Jones, and 85 in the case of Billy Smith, does it not stand to reason that you are dealing absolutely with the same tooth substance in each arch? That you are going to have but slight variation from the contact point, and which you need to get in order to have the same shaped arch.

If you have 90 millimeters of arch tooth substance to deal with from the buccal groove of the first molar to its opposite, you can vary that arch but very little and still have normality. It is impossible. If you have 85 millimeters you naturally would have a different shaped arch from one where you had 90 millimeters.

What are the men doing with the cases that come to them? What basis have you for the predetermination of the arch? Nothing but the eye at the present time. Dr.

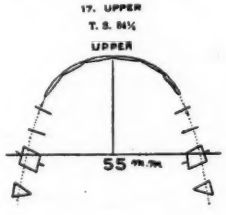


Fig. D.—Orthodontographic Normal Arch containing 84½ mm. of tooth substance, and arch width 55 mm. from buccal groove of first molar to its opposite.

Johnson is working on the right track, but there are a dozen different strings leading to the same point, and I am glad Dr. Johnson and several other men are making investigations along this line.

Supposing across the buccal groove from one side of the arch on the upper to the other you have 55 millimeters for a given tooth substance, if you have an ideal arch width to work to on a given tooth substance, and start in and prove that, it will help you. In my work I started out and worked very nearly a year, then I started to prove whether the work was correct. I began looking for the normal in the human mouth, and I have at the present time about fifty cases, and I can predetermine those arches for a given tooth substance. The greatest variation I have is one millimeter, and that is caused by the loss of the lower six year molar on one side.

I would like to make an appeal to the members here to get at these normal cases to check up my work and look for the normal for a given tooth substance to see what nature has done. My cases that I have treated and have established good relation between the tooth substance and the width of the molars, have been the easiest and most successful in retention. Here you see (indicating) the buccal groove measure, and I wish all the men, those who have been in practice for a long time, would go over their cases and tabulate those that have been most successful in retention, and see whether they shape or correspond with the work I have done up to the present time.

As I said before, I did not intend to speak on this subject, but I have been working along this line for a considerable time. It is an evolution of the work of Dr. Hawley,

Dr. Williams, and Dr. Stanton, and I have what I call the orthodontographic normal arch for a given tooth substance.

I have also developed a simple machine for surveying the malformed arch, and I wish to take this opportunity to present arches and the machine to you. I will give you the drawings, you can have them made, and if you wish to have that part of the arches copyrighted, so that you can have control of them, they are yours.

If my work is any help to you men, you are welcome to it. You can take it, pick it to pieces, or combine it with other ideas of other men. If there is anything in it that is good, save it and do not throw it away.

Dr. Frederick C. Kemple, New York City.—A few years ago in company with Dr. Clarence J. Grieves at the Baugh Institute of Anatomy in Philadelphia, I had the privilege of examining a rather large number of wet sections of the heads of children of ages varying from infancy to adult life. These specimens were made by Dr. Warren E. Davis for the purpose of studying the development of the accessory sinuses.

I was interested in finding out if there was any correlation between the development of the dental arch and the development of the nasal spaces and accessory sinuses. I was also interested in learning what change in the anatomic structure of the base of the skull might be induced by widening the upper dental arch that could possibly result in relieving pressure upon the pituitary body. The specimens examined, and there were quite a large number, apparently showed no definite relationship whatever between the development of the upper dental arch, the nasal spaces, and the accessory sinuses. Neither could either of us see how the widening of the upper dental arch could bring about a lowering of the body of the sphenoid bone, or in any other way relieve pressure upon the pituitary body. The anatomist in charge of the Institute ridiculed the idea of such a thing being possible.

Before examining these specimens and others in Dr. M. H. Cryer's collection, I had a preconceived notion that there was a definite relationship existing between these parts; that they developed more or less symmetrically; that well developed sinuses and nasal spaces accompanied well developed dental arches, and vice versa. But in my limited investigation I have found no evidence to support this theory. In fact just the opposite condition is found to exist so frequently that I am led to believe there may be no interdependence in the development of these parts. I am afraid that many of the idealistic theories in orthodontia will vanish into thin air under the searchlight of thorough scientific investigation, such as is being carried on by Dr. Johnson and Dr. Hellman.

It is a well-known fact in physiology that "hard structures must give way to the soft." In other words, slight pressure of any of the soft tissues upon any of the osseous tissues causes a giving way of the osseous tissue, either by resorption of the bone itself or by a change of its form. The records that Dr. Johnson is making of the nervous muscular action of the tongue are along this same line.

I am glad to have heard Dr. Johnson's paper, and to have seen the charts shown by Dr. Hellman. It is all very illuminating, and promises a brighter future for orthodontia. If a few more men will join in an effort to get at the truth, to uncover *facts* in orthodontia, it will not be many years until our specialty will rest on a scientific foundation, instead of being built upon the sand of a host of beautiful theories.

Dr. Hellman.—Dr. Johnson, you have shown one case in which the upper incisors were persistently drifting forward after retention. Did you observe whether that child or person was lisping?

Dr. Johnson.—No sir. We could not find any difficulty anywhere, and I would not have been led to this extreme if I had.

Dr. B. W. Weinberger, New York City.—I hesitate to discuss Dr. Johnson's paper because it would be unfair, for one can not do it justice without first thoroughly reading it. It proves one thing, however, that the general tendency of orthodontia in the last few years has changed and is progressing more towards the physiologic than the mechanical side. We must pay attention to the correlated facts between the various organs outside of the mouth and that brings us back to the point of the nervous system. This brings up

the question of calcium metabolism which has a direct bearing on tooth development and jaw growth. I do not know whether Dr. Johnson is familiar with the work of the neurologists. These men are paying a great deal of attention to the endocrine organs and their relation to the teeth and tooth substance, and to the construction and form of the teeth, and what direct bearing they have on the various nervous disturbances with which they have to deal. How much stress and how they are paying attention to the teeth and their form in trying to solve the various questions of thyroidism, pituitarism, and so on through the various cycles may be seen from recent literature. I think, as orthodontists, we have been very lax and in the future will have to pay more attention and open our eyes to the work that these men are doing. As orthodontists, we will have to recognize the knowledge that these men possess and the attention they have paid to the teeth and the bearing they have on calcium metabolism and on nervous disturbances with which they have to constantly deal. One of the main factors to be considered, and one of the first things they observed, is the blood pressure.

I want to ask Dr. Johnson whether he has taken into consideration blood pressure in charting these cases, because it is more than a nervous tendency for the tongue to raise the tip; and also indirectly to the endocrine organs which have a prenatal origin.

Dr. Johnson (closing).—I am very grateful to the men who have discussed my paper. It is very satisfying that Dr. Hellman should present the evidence he did at this time as he was wholly in ignorance as to what my paper was to be. We have evidently arrived at the same conclusions though following different lines of study.

Dr. Lischer misunderstood the reading of my paper. Variation I did not consider as exclusively of germinal origin. It may be of germinal origin or it may be of environmental origin. The form of an organ or part is the result of an interaction of forces. Two stones of different character exposed to the same environmental forces will take on different forms; and two stones of the same character exposed to different extraneous forces will show different conditions. The determining factor of form may be either heredity or environment. When we refer to the formative influence of function the word function is used in its broadest sense and not as referring to the specific activity of an organ or part. Function expresses all of the dynamic processes of the living organism; the complex of chemical reactions; the action, reaction and interaction of organs and parts in the adjustment of life.

Dr. Lischer.—Do you recognize modification?

Dr. Johnson.—Yes.

Dr. Lischer.—As distinct from variation?

Dr. Johnson.—The word variation covers the modification of form.

A Member.—What do you mean by modification?

Dr. Lischer.—Something that happens in the individual's lifetime.

Dr. Johnson.—The enlargement of a muscle as a result of exercise is modification, it is also variation. Variation may be qualitative as in mutations, illustrated in the work of Morgan on the Drosophilia; or it may be quantitative as in the development of a muscle. I fail to see in what way my concept of the problem of orthodontia and the remarks of Dr. Gilpatric coincide. I have merely endeavored to formulate a concept which will serve as a scientific basis for the study of the individual organism. The slides have indicated one way to study the forces determining the form of the dental arch.

Dr. Weinberger asked about blood pressure and the internal secretions. I have not gone into these things far enough to answer the question intelligently. There are, of course, a great many correlations we can make.

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Under the Editorial Supervision of

JAMES DAVID MCCOY, D.D.S., Los Angeles—ROBERT H. IVY, M.D., D.D.S., Milwaukee

B. FRANK GRAY, D.D.S., San Francisco—C. O. SIMPSON, M.D., D.D.S., St. Louis.

It is the object of this department to publish each month original articles on dental and oral radiography. The editors earnestly request the cooperation of the profession and will gladly consider for publication papers on this subject of interest to the dental profession. Articles with illustrations especially solicited.

RADIOGRAMS IN RELATION TO ORTHODONTIC TREATMENT*

BY T. G. DUCKWORTH, D.D.S., SAN ANTONIO, TEXAS

THERE are a number of conditions we must take under consideration when examining a mouth for the purpose of treating a case of malocclusion. It is not possible to determine the course of treatment of any orthodontic case unless we know or feel reasonably sure that certain conditions exist. It would be unfortunate to treat a case of malocclusion for several months under the impression that certain teeth would eventually erupt and take their position in the line of occlusion when in reality they were found to be impacted, transposed or missing entirely.

The application of the roentgen ray as a means of diagnosis of many conditions about the teeth and jaws is a method that has achieved a position of the utmost importance in recent years. Its value has long been recognized by the surgeon in the grosser lesions of bone, such as fractures, tumors, and dislocations. The surgeon is making use of the roentgen ray to a far greater extent than we can hope for, for the next few years at least. It is just as important and necessary that we make use of this valuable agent as it is applied to major surgery. Orthodontists are regarded as the guiding spirit in the eruption, development and position of the teeth and jaws. The application of the roentgen ray in determining the eruption of certain teeth is the only reliable source of information at our command. The extent of development and the position of unerupted teeth should be previous history in the treatment of malocclusion of orthodontia cases. It is not infrequent that the patients present themselves for orthodontic treatment with the first permanent molars decayed and the nerves exposed, oc-

*Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-9, 1919.

casionally other teeth are found in the same stage of neglect, and when this occurs, and particularly in children at the age of ten or twelve, or still younger, the orthodontia problem becomes twofold, and the complication sometimes results in everything but the ideal. To meet these conditions in fairness to the child, is to determine to what extent these teeth can be saved, and to what use they may be employed in correcting the malocclusion.

It is common mistake among parents, even though they are inclined to manifest considerable interest in the care of their children's teeth, to permit the six year molars to decay, thinking them to be deciduous teeth and of little consequence, as they are to be replaced by ones more permanent. When these unfortunate conditions are found to exist an explanation of their immediate correction becomes apparent and a roentgenographic study of these teeth is necessary in most instances.

Infection of the investing tissue, loss of bone structure as the result of pyorrhea are factors to be overcome in advance, or during the course of treatment in a number of cases, even though in children quite young, is due solely to the irregularity.

It may be interesting to note a case which presented itself for orthodontic treatment in which the lower six year molars were decayed and the nerves exposed. The child was twelve years of age and with a very good set of teeth, except the molars mentioned and the irregularity, which was a Class I case. Roentgenograms of the decayed molars were made and the patient referred to his dentist. The exposures were made for the purpose of determining the condition of the apical portion of the teeth, which was considered at the time rather doubtful as to whether or not it was possible to properly fill the canals, due to the very large opening.

Attempts were made under this condition to save the teeth long enough to establish the arches, which required considerable expansion. The nerves of the teeth were removed, but the canals were not filled except with a treatment and cement constituted the filling material for the remaining portion. Regulating appliances were adjusted and the case was practically finished when the child developed a condition in the region of the submaxillary gland, which corresponded in size to a hen egg, and which continued to become larger, and apparently movable. The parents of the child, thinking it to be mumps, visited the eye, ear, nose and throat man. The physician, realizing it was not an infection of the parotid gland, pronounced it a true dental problem. The infected area became quite marked, and x-ray examinations were made to determine the source of infection, and it was at this time that the canals of the devitalized teeth were found to have only treatments, but apparently in a normal condition, devoid of any rarefied area in the apical region. Realizing the condition was acute and could not expect destruction in so short a time, there was no hesitancy in having the tooth extracted, and particularly as the child's temperature was increasing. On extracting the tooth there was no evidence of pus nor was there any evidence of relief. The following day the child was removed to the hospital and an incision made at the lower border of the mandible near the angle, pus in great quantity was found, which afforded relief to the patient almost immediately. The point which I wish to emphasize, in the case just described, is that we do not

know at what time we must rely to a very great extent upon x-ray findings to determine the solution of some of our orthodontia cases. It is true that the x-ray findings were negative in that they showed no rarefied area at the apical end of the tooth, but it did prove that the condition was acute, and the clinical findings and history was such as to disprove an other source of infection.

When we expose an area for the purpose of locating missing or impacted teeth, our information is just as essential whether we find the teeth present or whether we do not find them, and this is true of pathologic conditions in that we eliminate these areas if no destruction of tissue is found to be present.

From reports a number of orthodontists are going into the x-ray field to a considerable extent, and this must be in itself evidence of the importance of bridging the gap from an uncertainty to a positive fact. Information is gained from an orthodontic standpoint in several ways, of which we are familiar, but when we can add to our store of knowledge in this respect, and particularly when it makes the work easier and more positive in the prognosis, it is more likely to arouse enthusiasm to where one will put forth his best efforts in accomplishing the desired results.

There is a common mistake prevalent among men beginning the use of the roentgen ray, in that they start out with quite difficult exposures at first, and upon failing to get results, soon become discouraged and seldom make attempts to work out a more perfect technic.

There has been some discussion of compromise treatment in regulating cases that have attracted some attention, in that some views are not acceptable to other men who may treat the same case, or one similar. Cases require close scrutiny, and study of details, by means of models, facial casts, photographs and x-ray findings to determine the end results, and compromise treatments are generally the results of x-ray findings.

As a matter of record we are in a position to state with some degree of assurance that our work is going to be permanent, and will not be interfered with by such conditions as impacted supplementary teeth, odontomas and unerupted third molars.

It is not infrequent that we make exposures of apparently normal areas of the teeth and process in which we find abnormal conditions of which the patient is entirely unaware, and which would eventually give rise to some displacement of the teeth or produce a necrotic condition and possible loss of some of the teeth, ultimately breaking up or destroying the effects of our orthodontic treatment. The usual clinical steps in the mouth examination are to be regarded as preliminary or leading up to the roentgenographic examination. Without them as a guide we should be forced to pick out certain suspected areas for roentgenographic study, thus many times overlooking far more important conditions or, as is done by many roentgenologists, make films showing every tooth in the mouth, which is obviously a waste of time and material, and also frequently incomplete.

To overcome the defects of the usual method of examination, plates (5x7) are made of each side, taking in all the teeth of the upper and lower jaws from the cuspids backward, and also showing the region of the angle and ramus. This gives a survey of the mouth, discounting any preconceived ideas as to conditions

expected to be found. Unsuspected abnormalities are in this way frequently discovered, which would be overlooked if only certain areas, or even the usual location of teeth were covered with film; in addition to this pathologic conditions about lower bicuspids and molars are generally more satisfactorily shown in plates than in films.

In canal work the best detail is obtained by using the films, and particularly where dimensions are essential.

By following out a definite routine in mouth examinations we are frequently rewarded by the detection of unerupted teeth, especially third molars, which have their influence upon the developing arches in several ways, cysts, odontomas, roots in the maxillary sinus, diseased sinuses are not to be overlooked.

Roentgenograms, as ordinarily made, are flat pictures, they do not give any perspective, and it is impossible in such a picture to determine the relative position of given parts except in two dimensions. In the majority of dental conditions in which the roentgen ray is an aid in diagnosis, the single flat odontograms give all necessary information; but occasionally one meets with a case in which other methods are called into use with advantage. In the case of an unerupted canine, for instance, it is impossible to determine from a single film whether the unerupted tooth lies on the labial or the lingual aspect of the other teeth, and clinical signs of its position are often lacking. When this is the case we must resort to stereoscopic methods, or make the exposures in different positions and compare the odontograms.

In a recent issue of the *International Journal of Orthodontia* we note the history of an impacted second permanent molar which offers some complications in its possible removal. The illustrations suggest well the means employed to locate and be governed by in remedying these conditions. The article referred to is by Dr. James David McCoy in the February number. These conditions are unusual, but when they do exist, we frequently, as the author of this article states, err in judgment.

Another very interesting case was reported by Dr. Federspiel in the same number of the *Journal;* of which you have all no doubt had occasion to read. Occasionally broken or fractured mandibles are the results of accidents which occur while orthodontic appliances are being worn, and where there is any possible chance for the appliance being forced into the tissues, the part should be thoroughly x-rayed.

DISCUSSION

Dr. Harry T. Deane, New York City.—I would like to say a few words in reference to the use of x-ray in orthodontia. There are a lot of points brought out in the paper of Dr. Duckworth's which are very important. Towards the latter part of his paper he makes the statement that it is impossible to determine from a single film whether the unerupted tooth lies on the labial or lingual aspect of the other teeth, and that clinical signs of its position are often lacking. A way has been worked out by taking different pictures at different angles which, if compared, will tell the labial or lingual side of the roots. Mr. Hanau has been working on something of that sort. If a man will give the time and devote the necessary study to his work and take the proper number of films, if he does not get the right result the first time, and will keep it up, he will surely determine where the tooth lies.

There is another point about the x-ray, and it is this: Many practitioners take

radiograms and see everything under the sun except what really exists. There are many men who are anxious to diagnose radiograms for you. For instance, we have laboratories existing all over the country at the present time, and patients go to one and have a series of radiograms taken of the whole mouth. These men will write you a history of these patients describing conditions they never have had and could not have had if they wanted to, and as a result the patients are so misled that they will not take your word concerning what you say because they say the radiograms show such and such a condition. This shows that the x-ray laboratories at the present time are doing a great deal of harm, and particularly is this so in New York, and I have no doubt the same condition exists in other cities. There are certain men who charge a small fee for taking a radiogram; they take a set of pictures of the whole mouth, and do not care whether the picture comes out good or bad. However, they try to satisfy the patient that there is something wrong.

In the taking of a radiogram in orthodontia the point has been brought up with regard to the wisdom teeth. That point comes up often. I have in mind a case that baffled a good many people because the tooth would not stay in the proper position in the left side of the jaw with a heavy retainer. Several radiograms were taken and a wisdom tooth was found just at the end of the first permanent molar and tipping on that, crowding the six year molar and opening the bite.

More radiograms should be taken and properly interpreted. A man should understand how to read a radiogram, and if he does not know how to do it, he should get somebody else to do so, because many mistakes are made by not knowing how to interpret radiograms.

The President.—There are some points in this paper which are very interesting and should be thoroughly discussed.

A Member.—A radiogram should be made of the teeth if the patient is at the age where the temporary molars are present, for the simple reason that very often we find no permanent teeth to follow the temporary teeth; and again, we find a space. We expect to find a bicuspid erupting when often none is there. I know in my own practice I have been misled many times by guessing, until I found it was better to have a radiogram taken. I think a radiogram ought to be taken of every case. I think possibly the plate is better than the film, because it shows the whole side of the teeth in occlusion, and there is a great deal to be seen on a plate that can not be seen on a film.

Another thing in connection with patients with fillings is this: Very often in taking radiograms the radiograms will show an infected area around the ends of a root of a tooth which we wish to use as an anchor for an appliance, and I think these things should be taken care of before our work is begun in order to prevent further trouble.

Dr. H. A. Pullen, Buffalo, New York.—I heartily coincide with the views expressed that every dental practitioner should use the x-ray in cases where it is really necessary, but I do not think it is necessary to use it in every case.

I have had an x-ray machine in my office for many years and have found it of distinct advantage rather than to have to send my cases to an x-ray specialist. After a while one becomes accustomed to reading his own radiograms if he has had enough experience in doing it.

In the city of Buffalo we have a dental college where men send their cases for x-ray examination, and they charge the small fee of two dollars. They happen to have the finest x-ray machine there is, so that many dentists send their cases to them. Some men who have a very fine type of people to deal with in their practices do not care to send them to the dental infirmary where they mix up with the poorer classes of the city, and where they do not have very good accommodations for them. At the same time, they can get the finest pictures from the best machine by men who are experts at this work. If you can not get good pictures with a moderate priced machine, it would be better to send your cases to an expert and have him see what he finds in the radiogram. It is well to keep an x-ray index the same as you keep a photographic index of your cases to which you can refer.

Dr. L. H. Wirt, South Bend, Indiana.—I would like to bring out this one point:

orthodontia being a specialty of dentistry, the opinion prevails that we should limit ourselves to orthodontia. In my town (South Bend) there is a practitioner whose assistant is doing orthodontia and he himself is doing oral surgery, and both of them doing general dentistry. He told me he was very glad to take up orthodontia; that he did not want to specialize in everything because the public might think they were jacks of all trades.

The point is essentially this: if the public expect a man to specialize and stick to his own specialty, I have wondered whether the profession considers that the orthodontist should take his own x-ray pictures, or send them to a radiodontist. Many of us will concede that we can interpret our own pictures of our own cases more intelligently than we can interpret the pictures that somebody else takes, or better than somebody else can interpret the pictures we have taken. However, there should not be any hard feelings between the radiodontist and the orthodontist if he has his own machine and gets his own results. If a practitioner can not get better results by doing his own x-ray work, the radiograms should be taken by an expert radiodontist who can explain thoroughly what is needed in the way of exposures, and it seems to me in this way we would better serve our patients if we can not possibly take the radiograms ourselves. I would like to get the opinions of others on this phase of the subject.

Dr. Martin Dewey, Chicago, Ill.—One thing which Dr. Dean mentioned with regard to x-ray laboratories is more important than the profession realizes. There have crept into dentistry a number of commercial men who are doing radiography, and unfortunately some members of the dental profession refer their cases to them because they take pictures for a small fee, and they take pictures because the patients want them, and not because they wish to get definite results.

The other day an announcement was sent to our office printed in large type to this effect: "We will give you 5 per cent of all business you send to us." Such a thing as that is not likely to be favored by the medical or dental profession. These fellows get around the ethical side because they do not belong to the profession.

Dr. Pullen mentioned having radiograms taken at dental colleges where they have the best machines to do the work. It is much safer if patients can go to a dental college to have radiograms taken than to an x-ray laboratory. I wonder how many cases of syphilis have been transferred from one patient to another by x-ray laboratories! The average operator sticks his fingers into a patient's mouth and then passes on and introduces his fingers again into the mouth of another patient without taking the proper aseptic precautions, and there is great danger of infection being transferred from one patient to another in x-ray laboratories where operators are not particularly careful.

Very recently there was invited an expert commercial man to read a paper before a city dental society, and after the paper had been read the officers realized they had made a mistake and were severely criticized by some of the profession.

I think you are making a mistake by sending patients to an x-ray laboratory unless the laboratory man who runs it is absolutely on the same plane with you professionally.

The paper called attention to the fact that very often better results can be obtained by the extraoral method than by the film because with the extraoral method you have a survey of the whole side of the mouth with the teeth in occlusion, and you get a better relation of all conditions than by individual films. For root canal work the intraoral film is better because it gives a better relation of the root canal. For orthodontic purposes the extraoral plate is much better because the parts are in much better relation.

I am rather inclined to believe that it is a wise thing to make radiograms of all patients presenting themselves for orthodontic treatment. A radiogram should be a part of the case record just the same as our models and photographs, because we find sometimes cases of premolars or second molars where they are going to erupt or do not erupt. The patients may come to us for treatment during the time of eruption of the teeth. The second molar may push against the distal side of the first molar, and it is a good thing to know whether it occurred during treatment or before, so radiograms should be made and we should make a lot of them.

Dr. Harry T. Deane, New York City.—Great care should be taken by the radiographer in taking an x-ray picture. The machine may not be ready to take an exposure

and it may take several minutes to get the picture you want. You have your machine in the operating room and you get it tuned up. In the first place, you should have a screen for you to stand behind while doing this work. In the second place, in the operating room you should have the patient leave the room while you are trying out the machine. Do not subject the patient to any more ray than is necessary. Sometimes you may have occasion to take a number of pictures, and you have your tube box open between the exposures. Don't let the patient sit in the chair; let her go outside or put her behind the screen. There is great danger of burning if you do not know how to handle the machine. If it is properly handled, and you do what you should do, there is no danger.

I have used the x-ray machine for many years and used the first tube shown in New York. It is true, that many men in the earlier days who experimented a good deal with the x-ray lost their fingers and have had other injuries from its use, yet I have never had anything happen to me. I do not say this in a boasting spirit. I have taken every precaution to guard against such dangers. Dr. Satterlee, who is a big man in the use of the x-ray, is gradually losing his fingers from the use of the x-ray, and it is doing other damage to him physically. I believe these injuries are due largely to carelessness in the beginning of the use of the x-ray, and in not taking the proper precautions to protect one's self.

In these days there is no excuse for causing a burn on account of long exposures because the machines are made fool proof. You have a screen; you have a cover for the back and rubber pads put around the patient, and you have your films taken with a small or short exposure. You take the films; instead of paper being around them, they have a piece of lead on one side with rounded corners. That is the best film on the market. It does not irritate the patient and there is no shock. You can take a good x-ray of a single tooth, unless you are looking for deep trouble, with a short exposure. If the radiographer is careful, it is surprising what he can do with the x-ray machine. If you take x-rays, get your screen, get a glass cover and rubber pads, and be sure you have all these things before you start in.

Dr. Max C. Ernst, St. Paul, Minnesota.—With reference to the question of radiographic laboratories, if you want to call them that, I think we as dentists are to blame very largely not only for that situation but for the illegal practice of dentistry as a whole. I do not think there is any state in the Union that has not a fair law governing the practice of dentistry. We have one in the State Legislature of Minnesota for passage. I agree with Dr. Deane that there are men running these radiographic laboratories and making diagnoses for people who are not practicing dentistry. If such a man has no license, he is practicing dentistry illegally. We can get after such men in a legal way if we want to push the matter. This thing goes even farther than the x-ray part of it. There are lots of places around the country where they diagnose cases of orthodontia, and I am quite sure some of these places have dentists who are not licensed to diagnose such cases. This matter will bear looking into by the different states.

Dr. S. W. Bradley, Ottawa, Canada.—I might cite a couple of cases that have occurred in my practice. When I was in general dentistry practicing in a small country village I used to do some orthodontia, and in one particular case I moved a first bicuspid forward to make room for the second bicuspid, which I thought was impacted and I held the separation for a year and then decided to let it drift back. Since having an x-ray machine of my own, that patient came into my office and I made a radiogram and found the second bicuspid was not there at all.

Just the other day I had a patient aged eight years come in with two lower incisors erupted in beautiful alignment, and with very little spacing. On making an examination I found the other permanent incisor was not there at all. I made a radiogram of it and found the lower incisor very far down in the tissue. I do not see how the orthodontist can expect to get along satisfactorily without the use of the x-ray, but great care must be taken in the use of it.

Dr. W. R. Dinham, Portland, Oregon.—I make it a point to investigate the third molar region of the mouth very thoroughly. Last winter, while I was in San Francisco, I had the pleasure of hearing Dr. Moorehouse speak along the line of a paper published

in the *International Journal of Orthodontia,* and he stated that he got much of his information from previous papers written by Dr. Dewey and others. He had a splendid collection of slides illustrating the damage that can be done by the impacted wisdom tooth.

I also saw two practical cases in Portland that came to me after they had been under treatment by Dr. Moorehouse, showing the damage that had been done by the eruption of the impacted tooth forcing forward the lower teeth. This movement was accomplished in spite of retention and everything else, so I do not know whether the rest of you have been so unfortunate as I have along these lines. The third molar has caused more failures along orthodontic lines than anything else with which I am familiar.

Dr. Weeks (closing the discussion for Dr. Duckworth).—This discussion on Dr. Duckworth's paper has been excellent and interesting, and there were a lot of good points in the paper.

Dr. Deane spoke about Mr. Hanau going to bring up another one of these survey outfits. I hope he will leave them alone. I am not a mathematician, and I do not want to go into fractions in order to locate teeth. I can locate a tooth for Mr. Hanau in three exposures quicker than he can read two plus two, and I do not need to have his compasses and everything else. I do not care where a tooth is, I can localize that tooth within the sixteenth of an inch. There are ways of focusing the tube to do that.

Shall the orthodontist do his own x-ray work? There has been considerable discussion on that phase of the subject. I believe he should do his own x-ray work.

Dr. Dewey spoke of the danger in connection with the use of the x-ray, and Dr. Deane spoke about how to avoid that danger. I do not think there is any more danger connected with taking x-ray pictures than in being in this room if it is done right. You can have a lead room to work in and in that the x-ray room. I am down for another discussion and I have the slides and x-ray pictures to show why I believe that, but I will leave that phase of the subject at this time and bring it up later.

The doctor spoke of testing his tube. That can be done away with by putting in a good x-ray outfit and a Coolidge tube. I can put my rheostat where it should be; I know what the spark is; I know how many milliamperes I use, and the number of degrees, and when I throw my lever it has to go. I get pictures in three minutes, and have the patient back under my care. I do not believe there is any danger in that. I put the patient in the chair and use my x-ray machine. I have a lead room just big enough to get around in; I have a leaded window to look through.

Reference was made to the film. The film should have a lead back, and no matter how strong the ray penetrates to the lead, it reflects back on the other side of the tooth and gives a proper perspective to that tooth, and does it much better than a film that has no lead back on it.

The rest of the speakers have brought out other points in this excellent paper, and I simply wanted to call attention to the points mentioned.

DISCUSSION OF PAPER BY DR. CLARENCE O. SIMPSON, "CO-OPERATION OF THE ORTHODONTIST AND THE RADIODONTIST"*

Dr. E. G. Weeks, Saginaw, Mich.—I agree with Dr. Simpson all the way through so far as the practice of the x-ray or radiography as a specialty is concerned. Radiography often brings certain conditions more clearly to our attention.

He speaks of ill-fitting crowns as shown by the radiograph. We can not have men in the dental profession doing everything because they send too much to the laboratory for the high polish rather than for the fit. I believe the man who is making an artificial denture throughout, who is doing nothing but that, will do it better than the man who does everything. The men who are doing crown work will take time to make a jacket crown rather than an umbrella crown.

Speaking of the qualifications of the radiodontist, what he has said can not be too strongly recommended and endorsed, in that the radiographer should spend time to study not only his machine but his dental anatomy more thoroughly than is followed by the general practitioner of dentistry. He should take particular pains in selecting his equipment. There are small vest pocket kodaks on the market, and if you take radiograms and look at them, you will see there is a great fuzz all around the teeth. The radiogram does not give a clear outline of the parts you want to examine. If a man is doing radiography and is a professional man, I think he can do more for us than we can do for ourselves in our own offices. I would not give up my machine because I like to play with it. I have time to do it, and I think a complete x-ray of a mouth that is undergoing orthodontic treatment is as absolutely essential as the making of models. I can show you lots of models in my office, and I will defy any man to tell whether the teeth are present or not. Again, I can show you the most beautiful results before I got the machine in, and within a few months later have the patient come in and see a filling in the tooth going and find a bicuspid slipping on the lingual or buccal side. All these things could be eliminated if we knew what was there before we started. With complete localization of the teeth by the x-ray we could practice better orthodontia. I believe there has been too much guesswork.

Dr. H. C. Pollock, St. Louis, Mo.—I am not particularly familiar with the subject and am hardly prepared to discuss it, not having any x-ray experience. I know the essayist takes the position that a man should specialize in his work, and that the work under consideration should be done by a radiodontist to get the best possible results from every angle, and I think he is absolutely correct, although he is more or less of an idealist. Personally, I feel that in the practice of orthodontia we should have the work done in a scientific manner by a radiodontist. It works out that way, and we as orthdontists do not get one-fifth of the pictures we should have of our cases. I agree with Dr. Weeks that we ought to have pictures of all cases, and unless we have we do not know whether we have a missing tooth, an impacted tooth, or what we have. We should have radiographs between the period of the eruption of the permanent teeth and the temporary teeth, but this is hardly possible unless we have our own machine. Otherwise, I agree thoroughly with the essayist. There is no question of a doubt but that the men who are doing x-ray work, and are doing it exclusively, are doing much better work than anyone else we see doing it. They get that detail that the general practitioner does not get. That has been my observation.

Dr. T. E. Purcell, Kansas City, Missouri.—I can not let this occasion pass without mentioning the fact in connection with Dr. Simpson's paper, which I have enjoyed very much, that the Dental Board of Missouri has warned the supply houses not to fit teeth to models and that sort of thing.

The solution of the practice of radiodontia has got to come from the radiodontist.

*Published in the JOURNAL, May, 1919, p. 226. Read before the Alumni Society of the Dewey School of Orthodontia, St. Louis, Mo., March 6-8, 1919.

The question of preventive dentistry is the most important thing that orthodontists and general practitioners of dentistry can consider today.

I have in my pocket some resolutions we are going to pass by the Missouri Dental Board, which will allow the very thing Dr. Simpson spoke of, namely, allow the assistant or dental nurse or dental hygienist to brush teeth. New York passed a law which allows the dental hygientists to clean the exposed surfaces of the teeth, but if there is a little collection of tartar below the gum which might result in pyorrhea, they must not go down there and remove it. The pyorrhea specialist would come in there.

The future of radiography comes from the orthodontist and radiodontist. We have a man in Kansas City who makes a specialty of radiography. He writes out a long diagnosis. He will say, for instance, that the upper right bicuspid has a diseased area at the end of the root, and if this can not be treated successfully I would advise extraction. Until the radiodontists can say definitely that this can be done and this can not be done, it is not a perfect profession. You can not expect the dental board composed of general practitioners of dentistry to say that this man or that man shall not take x-ray pictures. If the radiographers of the state would get together and outline some definite plan, we might be able to have some law on the subject. As it is now, we can not prevent any man from buying an x-ray machine and making radiographs and making wonderful diagnoses, so much so that you could not tell whether it was a tooth or a foot of which they had taken a picture.

We have idealists like Dr. Simpson, in the profession, who lift us out of a rut.

And we have not any more protection in radiography than we have in any other form of dentistry. I have a case now of a young girl with a second deciduous molar in place, and from the picture one would think that the bicuspid was up against the first molar crosswise in the jaw. But in six months the bicuspid appeared as nice as you please. The angle of the picture was wrong. I want the radiographer to take a picture and tell me definitely the condition of a certain tooth and its position, and not imagine this or that, then we will have a working agreement with the radiographer. Until we have that, and until radiographers work out a plan whereby we can regulate the practice of radiography, we shall have confusion and chaos.

Dr. George F. Burke, Detroit, Michigan.—We as a profession have been bothered to some extent by commercial dental radiographers, men who have neither received a medical nor dental degree, but not in late years so much as formerly.

It is my understanding that the Dental Board in Michigan interprets the taking of a dental x-ray film as a dental operation. At any rate, the attitude of the board in our state has put a quietus on the activities of the men who have taken neither a medical nor a dental degree. Certain it is, those men interested in dental radiography ought to interest themselves in this matter to a great extent, for the reason that men who are not familiar with the anatomy, pathology, and physiology of the human head ought not to attempt to read or interpret pictures for a client.

Dr. Martin Dewey, Chicago, Ill.—There is one thing that Dr. Simpson and Dr. Purcell spoke about concerning which I do not think they understand each other. As Dr. Purcell has stated, radiography is not a perfect science, but I think it depends upon the technic of the man taking the picture. If proper tehnic is used, the position of the tooth can be located quite accurately. Dr. Simpson referred particularly to the radiographic laboratories which are being conducted by the commercial men rather than by radiodontists who are dentists, and who have mastered the technic of taking pictures. We have in several states a number of x-ray laboratories conducted by men who are neither physicians nor dentists. These men make the argument that they are taking pictures, but we find all of them are willing to give a diagnosis if asked for, or some of them send in a diagnosis without being asked for it. Such laboratories as that should be regulated both by the medical and dental boards. It comes under one or both of these heads, because a man practicing dentistry or medicine, who takes a radiograph and diagnoses the case, is practicing medicine as much as the man who is called in consultation. The consulting physician gives his opinion regarding a certain case and by reason of that fact he is practicing medicine.

I do not know how the Missouri law reads, but it should be changed to put the commercial laboratories out of business. A man is a window trimmer one day and the next day a radiographer. Some of these men gain experience by being x-ray salesmen because they see a field in which they can make money, and they are not different from anybody else who enter fields without knowing anything about them. They know nothing about anatomy of the head or of the teeth. They are interested in making so many pictures each day and at such and such a price. Their work is very inferior, and they can not make a diagnosis because they know nothing about pathology. They have learned a few technical terms; they have learned medical terms that the medical men use, but they do not know what they mean. They have no knowledge of asepsis and of the spread of infection, and I think they are the worst parasites we have in the profession today. We can not blame everything on the state boards because the dental and medical professions have been responsible for the development of these parasites. The members of the dental profession have sent patients to these men because they take pictures cheaper. The dental and medical professions would kill these commercial laboratories themselves if they would use the right professional ethics. These commercial laboratories which Dr. Simpson condemns are being supported by certain members of the dental profession on account of the low price for which they take pictures, and one might as well send a patient to a plumber for a diagnosis as to send him to one of these laboratories. So there is creeping into the medical and dental professions these parasitic laboratories, if I might so call them, that are simply living off the dental profession because they appeal to the commercial side of the men who want to save a few dollars and are doing harm to the profession and a great deal more harm to the patients.

Dr. T. E. Purcell.—With reference to our Missouri Dental Law, there is no state that has a proper dental law for the simple reason that the members of our profession are doing what we have been spaking about. The profession is breaking up into specialties. Dr. Dewey, today, if he wanted to take the examination in the State of Nebraska under the state law, would have to fill teeth. If an orthodontist came to Missouri today, before the dental board would register him he would have to put in a certain number of fillings and make a set of teeth. That is the limit in that respect. Our dental boards have changed and have put on the statute books laws which do not solve the question.

I want to make an appeal to the radiographers to get together and see what kind of a law will protect us best in that regard and tell the dental board to put it on the statute books. We have a law now on our statute books which was copied by Michigan and Minnesota, and while it was not a model law, we thought it was when we put it on the statute books. We found out, after all, we had not a model law and will not have until the laws of the state recognize specialties, until radiodontia and orthodontia are recognized and various other things whereby a man coming from New York or from some other state to the State of Missouri can practice exodontia, orthodontia or radiodontia, and take examinations in these subjects only.

I would appeal again to the progressive men in x-ray work to get together and tell us the kind of law they want, then we can do something, otherwise we are working in the dark. I do not think it is wise to enact a dental law and have it put on the statute books before we really know what we want. In five years it might be an obstructive law instead of a constructive law, it might be the very thing we do not want to do. Let us go on for a while until we see where it brings us. If we find that dentistry is breaking up into specialties, then our dental laws will be more or less obsolete. We want the radiographers like Dr. Weeks and Dr. Simpson to tell us the kind of law that is needed for regulating the taking of radiographs. The mere fact that a man possesses a medical or dental degree does not mean that he can diagnose the case from a radiograph. That is not diagnosis by any means. We must have something definite along this line, a law that can be worked out from the experience of years as a constructive law, and not something that is holding us back.

Dr. Simpson (closing).—I appreciate this discussion. There were a number of points mentioned that could not be covered in the paper, but I am very grateful for one point which has been so thoroughly discussed, namely, that of regulating the future practice of

radiodontia. I believe the public and the profession will suffer from the further prostitution of radiography either dental or general. The points that were brought out by the different speakers were absolutely right.

Dr. Dewey presented an excellent argument when he said that this thing would not have become established had it not been supported by the profession. It is entirely within the power of the profession to control these things, but it is difficult to control the sentiments and ideals of the profession. We have a law in Missouri relating to the practice of dentistry which says that dental operations shall be performed only by those who are graduates in dentistry or have passed a satisfactory examination before the state board. There is no question that the practice of radiodontia, which means the manipulation of the teeth and soft tissues of the mouth, and the diagnosis of disease can be interpreted as the practice of dentistry. You can interpret the placing of a cotton dressing in an open cavity as the practice of dentistry. Much more important is the placing of a film which may be carelessly handled by unclean hands against the soft tissues, often producing a little irritation. There is an excellent opportunity for direct infection, and incidentally there is always danger present in the use of radiographic equipment. If it is not properly used, great harm can come from it,

Dr. Dewey spoke of salesmen doing radiographic work. I find more frequently it is the electricians who work into this. These men have not had the professional training or education for this work, and take radiographs for a small fee because they have not the training or knowledge to do the work as it ought to be done. They do not realize the import of it; they do not appreciate what the higher practice of radiodontia is; therefore, they render a very cheap, inefficient and easily produced service. Our law specifies some restriction about the practice of dentistry; it is merely a matter of interpretation whether or not the examination of the mouth, and making a diagnosis is the practice of dentistry. Also office assistants and women who have received little training along these lines are doing these operations. The same danger exists there as in minor dental operations. Furthermore, these partially trained assistants will produce radiographs which are misleading, which is another phase of the subject mentioned. By permitting the average office assistant to take radiographs in connection with these examinations, the operators may make incorrect diagnoses from them. I believe both of these things are well covered by the law. It is simply a matter of taking cognizance of the law and enforcing it.

One of the most radical enforcements of our dental law in Missouri is that in which dental supply houses have been instructed that their salesmen can not select artificial teeth and crowns for patients. You can send the model and shade guide, and they will select the teeth, but the salesman is not permitted to match the crowns for patients. A great many practitioners cut off the teeth and sent the patient to the supply house to save time and trouble, but the state board has instructed the supply houses to discontinue this practice. They have gone much farther in the interpretation of the law in that respect, than in permitting mechanics to make radiographic examinations of the mouth or permitting assistants who are not graduates in dentistry to make these examinations.

We hope within the next year to have an organization of radiodontists who can accomplish work along these and other lines in connection with the practice of dentistry. It is a comparatively undeveloped field and there is much to be done.

Dr. Pollock mentioned the point that it is difficult to secure a sufficient number of examinations for patients under orthodontic treatment. I think that is a matter of personal equation and methods. It is becoming easier to refer patients to the radiodontist. Patients are coming of their own accord and are suggesting it to the dentists. They are conceiving the idea that in order to have the work properly done a radiographic examination must be made, and I think we will all agree with that. They are suggesting this today, whereas ten years or even five years ago it would have been impractical to attempt to refer patients to radiodontists. At the present time and in the immediate future radiodontists will be consulted much more frequently than they have been in the past, and I see no reason why the radiodontist can not work in conjunction with the dentist if he is conveniently located. If you are located in a small city, where there is no man limiting his work to

dental radiography, it is a choice between doing the work yourself and sending it to a physician. On the other hand, where you are conveniently situated to a man who makes radiodontia a specialty, it is possible you will be able to secure better services by cooperating with him than in attempting to do the work yourself.

There are some technical phases connected with this subject which I expect to present next week in a paper entitled "Radiodontic Examinations for the Orthodontist." The present discussion is more a matter of professional relationship, and an attempt to present some ideals, some problems in the practice of radiodontia. I believe that it is only now being developed, and if you help the work along, within a few years you will find it will be of great assistance to you and that you have aided materially in developing a most important specialty in the practice of dentistry.

Dr. Purcell said the radiodontists made specific recommendations to the physician, and a few minutes later he said they did not know what they wanted and would not make any specific recommendations. In making these recommendations I think the average radiodontist is conservative and careful. He should never say that there is infection or an abscess, because he can not tell unless he makes a bacteriologic examination, and I do not believe an intelligent man engaged in this field of work would make that statement. But he can obtain information and evidence which will help the dentist in diagnosis. He can make recommendations contingent upon the clinical examination or bacteriologic examination. He is only supplying one certain service of what can be determined by the aid of the x-ray, which is the greatest diagnostic aid we have concerning the attachments and periapical structures of the teeth. He should limit himself only to that one specific thing of what modern practice has demonstrated can be shown by radiographic examination, and that is a great deal. When we have an efficient organization, we will be able to accomplish more along the lines of recommendation for legislation. Radiodontists should never overstep their field in making recommendations, and I do not believe Dr. Purcell would have any objections to the recommendations I make to the physician. I try never to be unfair to the dentists in this matter, but imply that this condition is the result of dental service, which was rendered at a time when the dental profession had not progressed to the present state of efficiency, and it was done without the aid of x-ray examination and things of that sort. Incidentally, the dentist should never resent the statement that there is periapical involvement of the tooth or there is evidence of infection from an apparently unfilled canal. I do not like to say that a canal is not filled, but apparently unfilled or partially filled. We seldom have to back down on a statement of that sort. The alert medical specialist has long since determined that his treatments are being handicapped by oral foci of infection. It has been proved and it has never been scientifically disproved, that there are secondary disturbances from these alveolar foci of infection. In the past we have been compelled to refer a patient to a general radiographer, a man of medical or laboratory training for an array of films showing a panoramic view of the teeth but deficient in information. If the physician or medical specialist was a conscientious conservative man he would not advise the extraction of teeth, or the retention of certain teeth. He would not feel competent to decide that question. If he consulted the family dentist the diagnosis might be further clouded. The family dentist might not be a man who was familiar with the far-reaching effects of the primary foci of infection. He might be prejudiced about operations in the mouth which he had performed. I think you will agree with that, and above all, he will surely be prejudiced by the problem of restoring lost teeth, so that his view is likely to be decidedly biased. The medical specialist welomes the man with whom he can talk seriously and who will take the responsibility of making an honest, conservative recommendation in these cases. There is no reason why it should ever work a hardship or unfairness upon the dentist. I am willing to leave my recommendation to men who are qualified to judge these matters, or who have kept in touch with the progress of focal infections and their influences and effects.

If I have said anything to cause you to seriously consider the possibilities of developing the limited practice of radiodontia and secured your cooperation towards its development, I believe you will find it of distinct advantage to the future of dentistry and also to the future of orthodontia. I thank you.

DEPARTMENT OF
ORAL SURGERY AND SURGICAL ORTHODONTIA

Under Editorial Supervision of

M. N. Federspiel, D.D.S., M.D., F.A.C.S., Milwaukee.—Vilray P. Blair, M.D., F.A.C.S., St. Louis, Mo.— Arthur E. Smith, M.D., D.D.S., Chicago.— William Carr, A.M., M.D., D.D.S., New York.—R. Boyd Bogle, M.D., D.D.S., Nashville. —Major Joseph D. Eby, D.D.S., Atlanta.—Thos. P. Hinman, D.D.S., Atlanta.

A DISCUSSION OF THE FACTORS TO BE CONSIDERED IN DETERMINING WHETHER TO EXTRACT OR CONSERVE DISEASED TEETH*

By Thomas B. Hartzell, D.M.D., M.D., Minneapolis, Minn.

IN meeting the representatives of the professions of medicine and dentistry in different parts of the United States, I have been impressed with the fact that the dental profession has not given evidence of appreciation of the magnitude of its responsibilities. The rank and file of the profession still believe their responsibilities to begin and end with the repair and conservation of the teeth themselves. May I not, therefore, bring to your attention a few striking facts which tend to place these responsibilities in a light which forces a keener appreciation of them?

It is now conceded by the pathologists of the country that heart, joint, and kidney infections are largely of mouth origin. The isolation of the Streptococcus viridans from the heart's blood and from ulcerating surfaces of the hearts of individuals, who have died from endocarditis, has been conclusively proved by numerous observers. The observations of our pathologists clearly indicate that heart, joint, and kidney infections are closely related, and may be regarded as one disease. This being the case, figures available from the bureau of vital statistics of the United States government tend to place in its proper relation, our responsibility as a profession. Certainly, the heart disease of the nation is largely traceable to mouth infection, and I here wish to submit figures from the Bureau of Vital Statistics for the years 1915 and 1916 on the relative importance of heart disease as compared to tuberculosis.

In the year 1915, the Bureau of Vital Statistics collected evidence to show that 105,202 people died of heart disease, while only 98,000 and some odd hun-

*Read before The Mid-Winter Clinic of Atlanta Society of Dental Surgeons, March 14, 1918, at Atlanta, Georgia. Reprinted by permission from American Journal of Surgery, May, 1919.

dreds died of tuberculosis in all its forms. These deaths occurred among 70 per cent of our population, because 30 per cent of our population failed to keep statistics of sufficient value to warrant their tabulation. In the year 1916, the contrast between heart disease and tuberculosis is even more marked, for in that year, the deaths from heart disease in the registration area numbered 114,171 or 159.4 persons per 100,000 of the population. The death rate from this cause shows a marked increase as compared with 1900 when it was only 123.1 per 100,000. The total number of deaths from heart disease in the whole country, estimating our population at 115,000,000, would be 182,850. Tuberculosis, in its various forms for the year 1916, destroyed 101,396 lives in the registration area. Because of the progress in the prevention and treatment of tuberculosis, the decline in our tuberculosis death rate has been quite pronounced, having fallen from 200.7 per 100,000 in 1907 to 141.6 in 1916—a decrease of almost thirty per cent. However, tuberculosis causes more deaths than any other malady, except heart disease, and 37 per cent more than all external causes, accidents, homicides, and suicides combined. Quoting again from the Bureau of Vital Statistics, the only remaining death rate higher than one hundred per 100,000 in 1916 was that of Bright's disease and acute nephritis. The total number of deaths from these maladies in 1916 was 75,316.[1]

It will be seen, therefore, that heart disease is a greater menace than tuberculosis and it is equally true that heart disease, to a very large extent, is preventable by proper mouth sanitation. The principal source of infection is the enormous growth of Streptococcus viridans in the oral cavity and on tooth surfaces, whence it enters the circulation through pyorrhea pockets, chronic dental abscesses, and tonsil crypts. These vital statistics just quoted take no account of the individuals whose lives are ruined by arthritis, nephritis of streptococcal origin, neuritis, gastric ulcer, chorea, septic purpura, iritis, and several less common forms of streptococcicosus, which term has been recently advocated by Ulrich of Minneapolis to cover the various forms of inflammatory and pathologic lesions resulting from the invasion of the tissues by the streptococcus.

I desire to cite a case here of heart disease due to mouth infection. The above heart is that of Doctor X, who, when first seen, was suffering from a gastric ulcer. He was sound in every other particular, as far as our chief of the school of medicine, University of Minnesota, could determine, save for the presence of eight abscessed teeth. He was advised to have his abscessed teeth removed, and was sent to his home. Doctor X returned home, but did not have his abscessed tooth removed. In less than one month he returned for further examination, at which time he was found to be running a temperature and exhibiting heart weakness, having developed a loud murmur heard at the apex and transmitted to the axilla.

The patient was sent to bed in the hospital, December 18, and an ice pack was immediately placed over the heart. The routine treatment for endocarditis was given and the extraction of his abscessed teeth was advised. The first abscessed tooth removed was done with every precaution to prevent contamination of the abscess. The tissues around the area were bathed in iodine, the tooth

[1]Census Bureau's Summary of Mortality Statistics for 1915-16.

root surface was scrubbed with alcohol and iodine. Saliva was excluded with a generous pack of sterile gauze. The tissues at the tooth neck were cauterized and the root was then extracted. The abscess sack was split and cultured from, and grew Streptococcus viridans in numbers. This technic was repeated on two abscessed teeth with the same result. Then, two more abscessed teeth were removed but the patient was absolutely unbenefited by these extractions. Therefore, we ceased removing teeth. This patient ran a course in the hospital of some eighty-two days, developing a purpura of the skin of the arms and legs; also a progressive involvement of the joints, in the end dying from complete exhaustion. Postmortem revealed a large ulcer in the ventricle, most of the walls of which are cut away to better photograph the ulcer. The ulcer is almost an inch in diameter, and one-eighth of an inch high. It has the appearance of a spoonful of strawberry jam flattened out on the auricular wall. The valves immediately below the ulcer have sloughed off, leaving nothing but stumps of scar tissue upon which have developed large vegetations. The pillars of the columna carneæ of the heart have also ulcerated. Culture from the ulcer at the time of postmortem developed prolific colonies of Streptococcus viridans on blood agar. A root tip amputation undertaken on the postmortem table under the strictest aseptic precautions also produced on culture, Streptococcus viridans. The postmortem further revealed small ulcers in the esophagus and also revealed a healed gastric ulcer.

Now in regard to the kidney, it must be remembered in thinking of Bright's disease that the medical profession does not always clearly differentiate kidney disease, and not infrequently, people die of acute kidney infection called Bright's disease. The term, Bright's disease, should only be applied to general glomerulo nephritis, which affects the glomeruli of the whole kidney. This brings me to the point I want to make, that streptococcal infection, whether the mild Streptococcus viridans or hemolytic streptococcus presents a complex of symptoms in many cases, which has clearly indicated to medicine that heart, joint, and kidney disease is in a great proportion of cases so closely associated that many physicians think of them as one. Whether this be a just conclusion or not, it tends to increase our responsibility in dealing with streptococcal infections of the mouth. I here submit a table from the Minnesota Division of the Mouth Infection Research Corps of the National Dental Association for the year ending July 1, 1916.[2] In this table, Hartzell and Henrici compare the destructive character of the hemolytic and nonhemolytic streptococci and show conclusively that the nonhemolytic streptococcus of the mouth can and does invade the tissues of these animals in about the same proportions, as does the hemolytic streptococcus. One should remember in studying this table that the nonhemolytic streptococcus makes its appearance about the sixth hour after life and is always present after such time, while the hemolytic streptococcus is an occasional visitor. Therefore, the importance of the nonhemolytic streptococcus to the life of a nation is infinitely greater from the standpoint of its destructive power than the hemolytic streptococcus. This tends to place our responsibility as dentists in a clearer light.

[2]Report of the Mouth-Infection Research Corps of the National Dental Association, for the year ending July 1, 1916. Reprinted from the Journal of the National Dental Association. Vol. III, No. 4. November, 1916, pp. 333-362.

The dental profession in years gone by has been chiefly engaged in conserving teeth without reference to or knowledge of the fact that in practicing this intensive conservation, they are oftentimes doing a serious damage to the patient, illustrated by the old aphorism, "Saving at the Spigot, but losing at the Bung." Medicine, on the other hand, has been quick to grasp every new thought or theory for controlling disease. This was clearly evidenced when the profession accepted the erroneous statements made by Bass and Johns and Barrett and Smith that ameba was the true cause of pyorrheal infection and that emetine was a sure cure for pyorrhea. It is not surprising, therefore, that there has sprung into being a great group of medical men and a few dentists, who, to control the death rate from mouth infection, vigorously assail the conservationist and ruthlessly sacrifice many valuable teeth.

In view of the fact that the writer has contributed a large amount of the evidence upon which these destructive mouth infections have been brought to the attention of the medical and dental world, it would seem no more than fair that he should also strive to place before the medical and dental profession a true perspective from which to observe the problem which necessarily confronts every man, practicing medicine and dentistry, as to what to do with diseased teeth and under what conditions we are justified in removing necessary dental masticating organs in order to prevent greater ills than those which arise from the lack of properly masticating our food. Therefore, let us consider for a moment the pathogenic flora of the mouth.

A close study of the mouth flora shows conclusively that while there are a great many bacteria found in the mouth at different times, there are really only four very important mouth organisms, and these I shall mention in the order of their importance.

There is first the Streptococcus salivarius, otherwise known as the Streptococcus viridans. Second, there is the pneumococcus. Third, the various members of the staphylococcal group—albus, aureus, and citreus. Fourth, is the fusiform bacillus. These organisms named are practically always to be found in the mouth. Of the group of four mentioned, we have found by actual investigation, by collecting the bacteria of the mouth in great quantities and administering these mixed masses of bacteria to animals, that the streptococcus is the only one which is regularly re-obtained in the lesions thus created. This same streptococcus, which bacteriologists formerly thought to be non-pathogenic, when transplanted into animals, is the germ which produces many varied forms of lesion, and according to our own observations and those of Gies and Kligler, composes approximately one-half the bulk of mouth growth.

The staphylococcus, roughly speaking, produces a little less than one-fifth of the mouth growth. The remaining 20 to 30 per cent of mouth growth in yeasts, thread forms, spirochete, and accidental visitants; also, the fusiform bacilli, and pneumococci.

In 1915, Madame Brailovsky-Lounkevitch, of the Pasteur Institute, published an exhaustive article recounting her experience in the examination of mouth flora from birth until adult life.[3] In this paper, she maintained and proved

[3]Contribution a l'etude d la Flore Microbienne Habituelle de la Couche Normale (Annales de l'Institut Pasteur, August, 1915, xxix, p. 379).

that the first organism to make its appearance in the mouth of a babe is the streptococcus salivarius, which occurs about the sixth hour, and from that time on until the eruption of teeth, is practically the only organism of the mouth except occasional transient accidental visitants.

We have found upon examination and study of the flora of the mouths of individuals, that from the period of eruption of teeth until adult life, this same streptococcus makes practically 50 per cent of the mouth growth. We now know that the presence of the streptococcus is almost universal. It occurs in houses, in dust, on the skin, in milk, and in many foods. There have been at least three streptococcal epidemics produced through the medium of milk, which have been reported in the medical journals. Probably, the most striking one was that in Boston, which was described by Theobald and Smith in the *Journal of Medical Research,*[4] and has been alluded to by many other writers.

The individuals who advocate complete destruction of dental organs in order to rid the body of streptococcal growth, therefore evidence profound ignorance Wholesale extraction of teeth will not rid the body of streptococcal growth. One might as well advise removal of the transverse colon to rid the body of the colon bacillus. A much more sane method of cutting down the inroads of mouth infection is that of vigorous systematic mouth sanitation together with the adoption of a diet planned to prevent intestinal putrefaction. This is just as capable of reducing the enormous mouth growth to a safe minimum as are the present methods for controlling bacterial growth in milk, now demanded by our cities. The difference by weight and count in the number of bacteria per milligram of tooth scrapings in dirty mouths to that of reasonably clean mouths has been shown by Kligler and Gies[5] to range from eight hundred million in the dirty mouth to five to eight million in the clean mouth. Translated into terms of oral prophylaxis, we may find that ten minutes a day spent in proper mouth sanitation will produce this safe minimum. The writer's first thought then in regard to the extraction question is that correct mouth sanitation and proper diet will make ruthless extraction of teeth unnecessary. A proper education of the dental profession in a broad way will soon enable them to place in a true perspective the factors which actually justify conservation, or, on the other hand, extraction.

Please recall that the mouth streptococcus makes its appearance at birth, and that it forms (roughly speaking) half the mouth growth; also, that our bodies are of greater or less degree, sensitized to its presence and that its most destructive attribute is the production of secondary anemia. Its toxins lessen vitality and lay a foundation of physical weakness in an individual for its ravages in the tissues when it becomes too numerous for the leucocytes in the blood stream to destroy the individual members of the family, which gain access to the stream. Therefore, the first broad view that should come into the mind of an individual as to the conservation or destruction of infected teeth should rest on the wealth or poverty of the blood stream. To illustrate, an individual with a full complement of red cells, five million to the cubic centimeter of blood with a hemoglobin of not less than eighty-five, and a leucocyte count of seven to

[4]Medical Research, 1915, xxxi, page 455.
[5]Journal of Allied Societies, September, 1915, x, No. 3, pp. 282-331.

eight thousand to the cubic centimeter together with a normal digestion, a normal urine, and a reasonable amount of energy, is safe in conserving any of his dental organs which might present for treatment. This conservation should be first, the reduction of mouth growth by prophylactic means to as nearly as possible the minimum, and, where teeth must be devitalized, such devitalization should be done under exactly the same kind of surgical asepsis, as is demanded of surgery of the brain or abdominal cavity.

Now, as to the other side of this question, as to when we are justified in breaking down dental mechanisms by extraction. This must rest again upon an examination of the patient's vital resistance, expressed by the blood stream, together with any evidence which tends to prove that the individual has been oversensitized or brought into a condition of anaphylaxis to streptococcal infection by a long exposure to such infection. A clinical picture, which would demand extraction, might be as follows: Early history of tooth and tonsil infection, swollen glands, draining the mouth and throat area, poverty of red cells, reduced hemoglobin, and a markedly increased or decreased leucocyte count. It is a well recognized fact that a leucocyte count above ten thousand is strongly indicative of deep seated infection, while a low leucocyte count, say five thousand or less, points to the fact that the leucocytes are waging a losing battle, particularly if such reduction in number is accompanied by reduced hemoglobin. If a clinical picture presents with the evidence of secondary infection, myocarditis, endocarditis, or nephritis accompanied by joint or kidney disease (evidenced by casts, albumin, or sugar) extraction is justifiable. Any of the factors above recited accompanied by the poverty of red cells and poverty of hemoglobin, even if the leucocyte count be normal, fully justify the extraction of diseased teeth. One might go on and enumerate combinations of clinical pictures which would bring in many other physical conditions dependent upon streptococciosis. For instance, in chronic streptococcal infection, one infrequently finds cholecystitis, and on palpation, an enlarged spleen. While the dentist, who has not had the advantage of a medical training, may not be capable of gathering all the evidence tending to establish a condition demanding the positive eradication of all primary sources of infection which can be reached, he can always or almost always bring into his counsel, an internist or the family physician to aid him in gathering the necessary data on which to base a sane conclusion. The time is fast approaching, if not already here, when the men in the practice of medicine and dentistry are willing to listen to the arguments, pro and con, which should determine a wise course of treatment. Individuals, who present a clinical picture which tends to establish the fact that the body has waged an unsuccessful war against streptococcal infection for a series of years, perhaps from youth up, and who are now suffering from any one of the evident phases of streptococcal infection, had better exist without teeth than go on with a primary intake from even one abscessed tooth. It is my observation that many times a sensitization of years' standing with a single, small continuous source of infection is sufficient to maintain such a marked secondary condition as to utterly unfit the individual for the duties of life. Let me mention a case illustrating this point.

A man forty-eight years of age, six feet, one inch tall, weight two hundred pounds, with a normal blood and urine, having led a very active and vigorous

life and possessing a very strong denture, was, during the latter part of 1916, stricken with septic purpura of the upper and lower extremities. This purpura came on following any muscular effort and was exaggerated by walking or carrying even the moderate weight of a light traveling bag. The hemorrhages would disappear on rest in bed, only to reappear when muscular effort was indulged in. The patient sought relief in different parts of the country and was advised that his tonsils were possibly the source of his infection. Consequently, his tonsils were removed in 1916 with some temporary benefit resulting thereafter, but after a period of rest, and the patient later again attempting to work, the hemorrhages recurred in greater numbers. When this man was first seen by the writer, there had recently occurred a large crop of new hemorrhages on his arms and legs. Patient was advised to go to bed and rest for a few days. Accompanying the purpura, was a broken compensation, which heart lesion doubtless originated from the some source of infection which caused the hemorrhages under the skin. The patient was subjected to a very searching physical examination by the chief of medicine, University of Minnesota. No source of infection could be demonstrated. Finally, this patient was referred to the writer for an examination of his mouth, and it was found that the individual had two devitalized teeth with very slight granulomata about their root ends. The gums adjoining the teeth were rather a purple or lavender color and very much thickened. No pus could be squeezed from the gums, although an instrument could be thrust into the gum crevice of the molar region both above and below from one-eighth to one-fourth of an inch. There were exhibited a few deposits on these roots. The removal of the deposits caused profuse hemorrhages from the gum, but no pus was seen to issue from these gums at any time. Slow treatment of the teeth was practiced, operating upon one tooth at time and allowing a period of three to five days to elapse before another was touched. Upon complete cleansing of all the root surfaces, the hemorrhages had quite disappeared and have never recurred in any great amount since. The patient occasionally, under heavy stress, will have a very few small punctate hemorrhages on the lower extremities above the ankles. Since the mouth treatment was given him, the patient has been engaged in his usual vocation for the past four months, although he has been incapacitated for the previous two years. The follow-up treatment in this case has been vigorous massage, which emptied the congested and infected blood from the tissues adjacent to the teeth into the general blood stream, so that the bacteria hitherto lodged in these tissues were readily phagocyted. This after-treatment was most important. The patient has also practiced intensive mouth and tooth sanitation, rubbing the teeth until they shine and removing from them most of the daily growth of bacteria. In this connection, it must be remembered that the streptococcal growth, when absolutely unrestrained by physical conditions, doubles every thirty minutes. Therefore, the great importance of vigorous scrubbing of mouth and tooth surfaces with the plentiful use of water to flush out the organisms, and the use of disclosing stain to guide the patient in his effort to get his teeth clean, and to restrain the growth and lessen the number of bacteria from day to day, is here emphasized.

I have mentioned this particular case because septic purpura is comparatively rare, and had it not been for the method adopted in eradicating this in-

fection the patient would never have completely recovered, as with a broken compensation dependent on myocarditis and a previous old endocarditis, had complete extraction been performed at one sitting, the result might have been the wrecking of the patient's whole chance of life. A normal blood and urine justified conservation.

Let me relate another case history, in which extraction was wrongly advised—that of a young woman thirty-two years old with an arthritis of the ankles and insteps of sufficient severity to make walking extremely painful, with absolutely no source of infection hitherto discovered to explain the arthritis. Examination of the mouth showed that every tooth in the upper and lower arch was vital. No large cavities existed and no lesion of the mouth, save a very vigorous gingivitis, involving less than one-eighth of an inch of the gum margin. Upon the application of disclosing stain, masses of bacterial plaques were revealed, covering all save the grinding surfaces of the teeth. This patient was so extremely sensitive that even in doing an ordinary prophylaxis, it was necessary to administer an anesthetic. Five different treatments, five days apart, using fine stones to grind out the pits dissolved into the enamel surface by the heavy masses of acid-forming cocci, and the reduction of mouth growth resulted in complete reduction of the swelling of the ankle and instep, and the continued practice of mouth prophylaxis of fifteen minutes a day, massaging the gums with the ends of half inch cotton rolls and scrubbing the teeth with brush and paste, applying disclosing stain twice a week, resulted in a complete cure of the gingivitis and the arthritis of the feet, which cure is still perfect. It must be remembered that no dead pulps existed and no teeth were extracted and the blood picture was good.

Take a third case, a young woman thirty-five years of age; two children, one eight years old, and the second child lost from puerperal uremia, accompanied with a blood pressure of 250. No cause known for the uremia. Patient was advised that the condition arose as a result of mouth infection and was referred to the writer for the complete removal of all her teeth. A careful examination of the teeth in the arches showed pyorrhea pockets around the molars, none of which were more than one-eighth of an inch in depth, and two pulpless teeth, left and right laterals in the upper arch. The roots of these teeth were rather imperfectly filled and presented small granulomata. The treatment given this patient was slow inoculation by pyorrhea treatment given seven or eight days apart, and was completed by the amputation of the two diseased root tips in question. The patient at the beginning of treatment presented casts and albumin in her urine, and presented blood pressure of 250. At the close of her mouth treatment, the blood pressure had dropped to 190 and only an occasional trace of albumin can now be found in her urine.

These three cases serve to illustrate what may be done by intelligent conservation accompanied by proper daily mouth sanitation. In these three cases, the hemoglobin and red cell count were practically normal, and the leucocyte count showed a rise of two to three thousand. Had these cases presented very marked anemias or past histories of long drawn-out chronic infections it probably would have been impossible to have benefited them, but the leucocyte count and the

hemoglobin indicated to the writer a strong possibility for cure. Though in two instances, complete removal of the teeth was advocated, no teeth were removed, while in the case of septic purpura, the third molars were removed because the pockets around the third molars were more than one-fourth of an inch in depth, and the balance of the denture was in such perfect condition that the patient could well afford the loss of his third molars.

Allow me to present a case illustrating the line to be followed where secondary anemia has existed for some time.

Mrs. D., seventy years of age, presented a set of sound teeth, which formerly had been affected with pyorrhea. Pockets around teeth but not discharging pus. When she first appeared April 17, her red cell count was 3,000,000 and her hemoglobin was 70. Patient desired the removal of all her teeth as she had spent the winter in the South and lived under the most encouraging conditions to improve her health and increase the hemoglobin and red cell count. No improvement of anemia occurred. Slow extraction of her devitalized teeth was undertaken, as well as those affected with pyorrhea—one tooth every week or ten days. Since this has been accomplished, her red cell count has increased to 4,100,000. In this case, pyorrhea treatment had been administered three years before, and as far as the mouth tissues were concerned, the treatment was apparently successful. Nevertheless, there must have been a sufficient amount of growth around the dead teeth and in the seemingly healed pyorrhea pockets to reduce the patient's hemoglobin and blood count. Though no masticating surfaces have been placed in this mouth following the extractions, the patient being limited to the incisors and cuspids above and below, the red cell count has increased.

In this case without a blood picture, conservation would surely have demanded retention of the teeth. The blood picture, however, fully justified extraction, and though it was necessary to break down a good masticating mechanism, the patient was greatly benefited as far as her general health was concerned. In this connection, too much stress can not be put upon the pioneer work done on the subject of hemanalysis and urinalysis by Colonel Wm. H. G. Logan. The result of his experimental work is recorded in the Dental Review, September, 1916.

Another case, a man about sixty years of age presented teeth which were apparently solid in his arches, but with a series of pyorrhea pockets involving most of the teeth. This case seemed to be clearly within the scope of successful treatment. Therefore, one pyorrhea treatment was given, which markedly reduced the energy of the patient. The patient returned in one week for an additional pyorrhea treatment. Immediate examination of the urine was suggested. The urine was carefully examined. The specific gravity was high and it contained between 4 and 5 per cent of sugar. Conservative treatment of these teeth was immediately discontinued, and extractions were undertaken at intervals of seven or eight days apart. In this instance, the patient was saved the burden of pyorrhea treatment. Under ordinary conditions with a healthy kidney and normal blood picture, these teeth would have been treated.

Therefore, we need to emphasize the fact that modern means of laboratory

diagnosis and the taking of careful case histories with the modern x-ray pictures, should be the foundation stones upon which conservative or destructive dentistry should be determined.

If the dental and medical professions will get together on all cases in which extraction is advocated, and will gather and weigh the evidence each case presents, it seems altogether likely to me that we can arrive at such a sane and reasonable judgment of the conditions that justice will be done to all.

A CASE OF IRITIS DUE TO THIRD MOLAR IMPACTION*

By T. I. Leiche, D.D.S., Chicago, Ill.

THE case history of Mr. C. P., Age 42. In Aug., 1917, the patient had a severe attack of iritis and neuralgia of the left side of the face, head, neck and shoulder.

Oculist's treatment: Sodium salicylate, atropine in eye—2 injections of strepto-staphylococcus vaccine. The attack lasted three weeks. He then suffered a nervous breakdown, and was sent to the country for two months to recuperate. He recovered slowly.

In Feb., 1918, a second attack occurred which commenced after he had been exposed to cold. The attack lasted a week. Treatment as in first attack, but instead of vaccine he was given intravenous injection of some other remedy.

He had no history of lues. Two Wassermann tests were made, both negative.

At this time he was referred to the writer. Skiagrams were taken of both dental arches. This revealed an impacted third molar in the upper left arch.

He was advised to have it removed, but refused such treatment. In Sept., 1918, he again suffered an attack. After having been in bed about a week he presented himself to have the impacted tooth removed.

It was decided to remove both the second and third molars under infiltration anesthesia.

Within 12 hours afterwards the iritis subsided and in a week the neuralgia had disappeared.

To date there has been no recurrence of the disorder.

---

*American Journal of Surgery, vol. xxxiii. No. 5, May 1919.

ABSTRACT OF CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

ORTHODONTIA

Orthodontic Technic. Facial Impressions and Casts. Ch. A. Spahn. The New Jersey Dental Journal, 1919, p. 135.

Orthodontic procedures and surgical operations for the correction of dento-facial deformities are greatly facilitated by the employment of facial plaster casts, made from plaster impressions which exactly represent the natural contours. The superiority of these casts, as compared to facial photographs, is emphasized by the author who points out that they permit an examination of every outline from different angles of observation. The patient's confidence and intelligent cooperation having been secured, he should be placed in an easy slanting position; every part of the face where the plaster is to be laid is then rapidly brushed over with partially liquefied white vaseline, using preferably a small shaving brush, and commencing with the cheek. Next, the vaseline is applied to the mouth, lips, and teeth, if the latter are exposed. The patient is instructed to look upward for a few moments while the vaseline is carried up under the eye, in order to protect the lashes of the upper lid. The eyes being closed, the surface of the upper lid is lubricated down to the lashes, then the depression surrounding the canthus down over the nose to the borders of the nostrils. The vaseline should stop just beyond the border of the median line of the face, for a cast of the profile only. If a front view impression is intended to be taken in one piece, its distal borders should not extend beyond the molar prominences, as otherwise it will be difficult to remove without breaking.

The plaster should be of a fine but slowly setting quality, mixed with a slight excess of water and stirred to a smooth clinging consistency, easily handled with a spatula and adhering to inclined surfaces. It is laid with a spatula of the ordinary width, but about two-thirds the usual length, first upon the cheek, passing toward the mouth, extending it beyond the median line, and from the wings and septum of the nose to a point well beneath the chin. With the patient looking steadily toward the ceiling, the cheek is then covered to the border of the lower lid. The plaster must be spread smoothly over the surface and

down into deep impressions, as between lips, around exposed teeth, etc. To begin with, the plaster should be no thicker than is required for the impression; it can be reinforced finally at the weaker points for strength. The manipulation of the plaster must be skillfully conducted, guarding against all abrupt or awkward motions which may hurt or startle the patient.

New Pincers for the Adjustment of Angle's Ribbon Arch and Bracket. L. A. Carrea. La Odontologia Argentina, 1918, x, No. 12, p. 397.

In adjusting the elastic ribbon arch in the brackets of the modern Angle apparatus the chief difficulty consists in overcoming the resistance of the ribbon arch and in fixing it gently and securely in the bracket, under avoidance of detachment of the band which holds the bracket, from the tooth to which it is fixed. In the *Dental Cosmos* of November, 1917, R. W. Gaston contributed a description of a set of original devices, consisting of a male and a female instrument, which act by simple leverage, but are not absolutely reliable and do not entirely protect against the danger of false passages or displacement of parts of the apparatus. A cheap and simple appliance devised by Carrea guards against these inconveniences, permitting accurate support, regulating the force, and reliably attaching the ribbon arch to the bracket. The safety-pin of Angle may be employed at the same time. The explanation in the text of the author's new pincers or nippers for the adjustment of Angle's ribbon arch and bracket is based on a number of illustrations without which all attempts at description would be futile.

The Teeth and Tonsils as Causative Factors in Arthritis. R. Hammond. The American Journal of the Medical Sciences, 1918, clvi, p. 541.

Summary: The relation of the teeth and tonsils to arthritis is at present a moot question. Billings and his followers point to the careful work of Rosenow and others on the bacteriology of arthritis and to the numerous cases of improvement and care of arthritis following removal of diseased teeth and tonsils. They believe that this proves the accuracy of their contention that a focus of infection exists in the head in many of these cases. On the other hand, many trained pathologists and reputable clinicians have been unable to reproduce either the laboratory findings or the clinical results of the Chicago workers. Consequently they either reject the theory as a whole or accept it in a greatly modified form. It is probable that the pendulum has swung too far in the direction of the wholesale removal of teeth and tonsils. The truth will probably be found in a middle ground somewhere between these divergent theories. There is undoubted improvement in numerous cases of arthritis following the removal of an abscessed tooth or a diseased tonsil or when a case of pyorrhea has received proper treatment. On the contrary, many such cases are given similar careful treatment without affecting the progress of the joint condition in the slightest degree. One reason for the failure to obtain successful results in arthritis by treatment of dental and tonsillar disease is that the cases have been selected without knowledge of the exact pathologic condition present in the or-

gan in question. Many apical abscesses in which nature had effected a cure by walling off the disease have been treated by extraction of teeth. This has resulted not only in the loss of valuable teeth, but has at times been the cause of a dissemination of the infection to other parts of the body, with dire results. Careful and specific training is essential to the recognition of a tooth or tonsil as an active agent of infection, and such knowledge must be supplemented by accurate interpretation of dental roentgenograms and skilful laboratory work. The x-rays are of the greatest value in accurately diagnosing certain diseased conditions of the teeth which are considered to have an etiologic relation to arthritis. The greatest field of usefulness probably is in locating abscesses around the apices of nonvital teeth. The interpretation of dental roentgenograms is full of pitfalls; at certain angles the shadows of the nasal cavity or antrum may overlie the tooth and simulate the appearance of an abscess. An abscess may exist which can not be revealed by the roentgen rays. Again, a crudely interpreted x-ray picture may lead to the sacrifice of unoffending teeth. Arthritic cases by no means always clear up after mouth infection has been removed. In acute arthritis the probability of producing a cure or improvement by the removal of a supposed focus in the teeth or tonsils is greater than in cases in the chronic stage. It is unreasonable to suppose that a restoration of function can be brought about in joints where extensive pathologic changes have taken place. But even when no change is apparent in the joint condition, proper treatment of diseased conditions of the teeth and tonsils is usually followed by marked improvement in the general health of the patients.

Chronic Marginal Gingivitis: Its Commonest Causes. F. M. Holborn, British Dental Journal, 1919, xl, No. 9, p. 329.

In this article, which is destined primarily for students and for those who have not had the opportunity of observing the same patients' mouths over a period of many years, the author calls attention to some very common causes of marginal gingivitis which are apt to be overlooked, such as slightly receding, hypertrophied, or readily bleeding gum margins, or hard, dark calculi, more or less inacessibly situated beneath the gum. The fact is emphasized that for the maintenance of the gums in a healthy condition, and for the prevention of the formation of so-called serumal calculus, by far the most helpful procedure is regular massage. Applied by the patient himself, with greased thumb or forefinger, in a direction from the gums to the teeth, so as to express therefrom remnants of food and so forth. The thick, soft yellow tartar formed by the action of salts in the saliva mixed with food is fairly easy to remove. The origin of hard, dark calculus beneath the gum and between the teeth is obscure, and the author is inclined to interpret it as a product thrown out by inflamed gum margins, since it is always present in that condition. It is also a continuing cause of further gingivitis, and therefore part of a vicious circle. The insertion of fillings with badly finished cervical margins is followed sooner or later by absorption of gum and periodontal membrane, and formation of hard calculus. Dentures and orthodontic appliances often cause considerable gingivitis and

chronic periodontitis, whereas, local marginal gingivitis is usually caused by loss of function, loss of and faulty contact point, malocclusion, crown and denture bands, bridge-work, fillings with projecting cervical margins.

ORAL SURGERY

Tumors from a Dental Standpoint. M. Wassman. The Pacific Dental Gazette, 1919, xxvii, No. 3, p. 127.

The author emphasizes the advisability of keeping tumors, both innocent and malignant, constantly in mind in the practice of dentistry. Any abnormal conditions in the oral cavity should immediately arouse the interest of the dentist. By far the best means of diagnosis of a tumor or a suspected tumor is a histologic diagnosis. After it has been ascertained whether the growth is benign or malignant, a differentiation must be made between sarcoma and carcinoma. The prognosis in most cases in cancer of the lips, floor of the mouth, tongue and jaws is at best very grave. The only reliable method of treatment is to effect the removal or destrction of malignant growths.

Of special interest to the dental surgeon are odontomas, or benign tumors which arise from tooth germ, in part or as a whole. Epithelial odontomas, derived from the enamel, occur usually in the mandible, but have also been found in the maxilla. The tumor consists of spaces lined with epithelium, which are developed as irregular outgrowths from the enamel organ. They may grow to an enormous size. Follicular odontomas are produced by the development of a cavity around a misplaced or ill-developed permanent tooth. A radicular odontoma is a tumor composed of cement substance which develops at the root of a tooth. A composite odontoma is derived from the whole tooth germ and consists of a conglomeration of the various tissues entering into the formation of the tooth, so intermingled that the individual tissues can not be distinguished. These growths develop in the jaws and may attain a large size. The germ of any permanent tooth may develop into an odontoma, or two or more teeth may be involved in one tumor.

The eruption of an odontoma usually occurs between the 20th and 25th year of life, these tumors having a well-marked tendency to remain quiescent for a long time. The diagnosis of these growths after they appear above the gum is difficult, and they have very often been taken for a myeloma, a sarcoma, or a piece of dead bone. The use of the x-ray is by far the best method of diagnosis.

Dental cysts, in the form of fibrous sacs containing cholesterin crystals, are sometimes found at the root of a dead permanent tooth, in both the lower and upper jaws; in the latter, they often invade the antrum and simulate a local abscess. They are usually small, the size of an apple seed, and are met with in extracting pulpless teeth. Treatment consists in the removal of the roots and the scraping of the cyst wall; when the cyst has invaded the antrum, a small portion of the bone must be removed to afford easy access to the cyst cavity.

A single case of cancer of the pericementum is on record in the literature.

Excision of the maxilla proved necessary and was performed in 1901; the patient, a young woman, fully recovered and today wears an obturator.

Some Aspects of Maxillary Antrum Disease. W. Barrie Brownlee. British Medical Journal, October 12, 1918, p. 403.

The relation of antrum disease to surrounding diseased organs is illustrated by the author by means of four cases in which the antrum disease was the primary infection or at any rate, its presence prevented these structures recovering under the usual methods of treatment. The first two patients were women of 31 and 26 years, respectively; in the former, who suffered from dacryocystitis and antrum disease, the performance of a double radical antrum operation was followed by a return of the lacrimal condition to normal within a week after the operation. In the second case, the ear discharge (which had persisted since the performance of a radical mastoid operation two years previously) disappeared within a month after a radical antrum operation with the intranasal frontal sinus operation and removal of the anterior ethmoidal cells on both sides. A double antrum operation proved equally successful in the case of a boy twelve years of age with otitis media and antrum disease, and in a boy of fifteen years suffering from left supraorbital pain, deviated septum and antrum disease.

The radical method of operation, type Caldwell-Lac, was adopted by the author in all these cases, the technic employed being that of De W. S. Syme of Glasgow. By this method a better view is obtained of the interior of the antrum, and the vertical incision has many other obvious advantages; moreover, the whole operation can be done with comparative comfort to the patient under local anesthesia, preceded by a hypodermic of morphine or omnopon. The great advantage of the method is that it is practically bloodless, whether done under local or general anesthesia.

The chief point regarding the last two cases is the age of the patients, twelve and fifteen years. Antrum disease is by no means uncommon in children about this age, or even younger, and a nasal discharge at this time of life is often correctly put down to the presence of adenoids; but if the nasal discharge does not cease within two months of the adenoid operation, a careful examination of the nose will frequently reveal the cause of the trouble in the presence of a deviated septum or antrum disease, or both combined.

Iodine in Dentistry. L. E. Payne. The Dental Surgeon, 1919, xvi, 106.

The great antiseptic and powerful bactericidal properties of this drug are emphasized by the author, who points out that an immediate application of iodine may be relied upon as a sure preventive of infection, in case of slight wounds or injuries of the mouth during the performance of dental operations. In the presence of dental caries, a few drops of iodine tincture in a small tumbler of warm water have an excellent effect, acting as a very useful mouth wash. As a precaution against infection of the sockets, in the extracting of septic teeth, a solution applied to the gums before and after the operation is most effective. In pyorrhea alveolaris, iodine may always be advantageously applied

to the gum pockets after thorough cleansing has been accomplished, and in this disease it undoubtedly acts as a counter-irritant as well as an antiseptic and bactericide. As a counter-irritant, iodine relieves periodontitis and pulpitis, and reduces all inflammatory conditions. Discoloration of the patient's mouth and lips may be avoided through liberation of the iodine by the use of hydrogen peroxide as a wash. Iodine penetrates deeply into the tissues and is absorbed very rapidly. It should not be used indiscriminately or in too great a quantity, as some patients are very susceptible thereto.

The Syndrome of the Retro-Parotid Space. M. Villaret and Faure-Beaulieu, La Presse Medicale, 1918, 26, p. 591.

This syndrome is characterized by evidence of involvement of the hypoglossal nerve, giving rise to hemiatrophy and paralysis of the tongue, of the sympathetic nerve, causing exophthalmos and narrowing of the palpebral fissure, with miosis; of the pneumogastric nerve as shown by paralysis of one vocal cord; and of the glossopharyngeal nerve, giving rise to disturbances in taste. The knowledge of this syndrome, which was noted by the authors in four cases since the beginning of the war, is not merely of theoretical interest, but permits the exact localization of the injury. The so-called syndrome of the posterior lacerate foramen is not associated with involvement of the sympathetic nerve, barring a few exceptional cases.

Plastic Surgery and Prothesic Appliances on the Terminal Treatment of Severe Facial Mutilations. L. Dufourmentel. Paris Medical, 1919, ix, No. 12, p. 229.

In a general way, the operator should be guided by the rule to carry his repair work as far as possible, the prothesist not starting on his permanent work until the surgeon leaves off. Surgical repair alone is not satisfactory unless it restores to the face, objectively, a normal configuration, subjectively the exercise of the various functions, such as mastication, phonation, nasal respiration, closure of the eyelids, etc. The role of the prothesis begins when these conditions can not be realized. Its results are especially valuable from the objective viewpoint; for physiologically, it can replace merely the function of mastication, and that only in those cases where the lower maxilla and its motor apparatus have been spared, the prothesis concerning only the dental system. Anatomically its benefit may be considerable, although fortunately cases of this kind are of exceptional occurrence. Among several thousand wounded soldiers with facial injuries, the author knows of no more than fifty for whom it was necessary to supplement the grafts by the application of a more or less extensive face mask. In all cases and varieties of facial destruction, the surgical treatment must and can obtain this result that the traumatic gap, no matter how extensive, becomes entirely covered with integument. There exists no mutilation compatible with survival in which this covering of the lesion is not practicable, it is absolutely essential to the patient's life and to the possibility of easily wearing a face mask. The latter will at best be never more than an object of external adornment, and

the surgeon must always aim at the minimum result that no more dressings have to be worn, which means that the gap in its entire extent must be covered with healthy skin. The rapid progress of reconstructive surgery and the constant invention of more and more intrepid procedures hold out the promise that the indications for prothesic apparatus will continue to diminish, although their total disappearance is not yet in sight.

Focal Infections in Childhood. S. Blum. The American Journal of the Medical Sciences, 1918, clvi, p. 681.

Upon the basis of his investigations the author concludes that focal infections may be created by operative procedures such as tonsillectomy and orthodontia. Complicated mechanical apparatus employed in orthodontia for straightening the teeth affords excellent opportunities for bacteria to congregate, and the forcing of teeth about in their alveolar sockets opens to the assembled bacteria inviting avenues for invasion. Nervous and digestive disorders result. The author has seen cervical adenitis traced to tooth manipulation. Warning against the creation of foci of infection by operative interference, he emphasizes that the teeth and tonsils should not be indiscriminately removed before their activity as a seat of focal infection has been positively established.

Plastic Repair of Large or Total Defects of the Upper Lip. J. Joseph. Münchener medicinische Wochenschrift, 1918, No. 46, p. 1287.

The current methods of plastic restoration of large or total defects of the upper lip vary greatly, according to the sex of the patient. In men who should at the same time attempt to grow a beard, the best methods consist in the formation of long tapering flaps from the skin of the cheeks and neck; furthermore, the transplantation of a pedunculated flap from the skin of the head, with substitution of the mucosa from the cheek adjacent to the defect (author's method) or from the skin of the forehead adjoining the scalp (Lexer). A very reliable procedure especially recommended by the author, is the transplantation of a bridge-flap from the scalp, with pedicles at both ears, and containing the two temporal arteries; with replacement of the mucosa from the cheeks or possibly from the neighboring frontal skin; or through preliminary transplantation of a free epidermis flap under the loosened scalp. Some surgeons believe in drawing together a number of bridle-like flaps cut square out of the cheeks, but this procedure is unconditionally rejected by the author for large, more particularly total defects of the upper lip, the operation being usually unsuccessful on account of overstitching of the flaps, while the prospects of the other plastic methods are impaired by the remaining cicatrices. In women, where scarring and hairiness of the face must be avoided as well as possible, primary transplantation from the skin of the upper arm enters primarily into consideration, assisted if necessary by a pedunculated flap from the skin of the lower chin.

Repair of the upper lip by means of tapering skin flaps from the cheeks and

neck was successfully carried out by the author in five cases of war injuries, in two of which, moreover, considerable gaps of the red upper lip were repaired from mucosa of the lower lip.

A Noteworthy Affection of the Upper Incisor Teeth. L. Dubreuil-Chambardel. Bulletin de l'Academie de Medicine, 1919, lxxxi, 84.

In the course of twenty years, the author was enabled to observe a noteworthy dental condition in forty individuals of both sexes. Beginning at the approximate age of fourteen years, the affection makes its appearance in the form of simultaneous caries of the four maxillary incisors. The dental caries take a rapid course, until by the end of four or five years, this group of teeth has been definitely destroyed. An unusually pronounced type of ogival arch was noted in the palate of eighty per cent of these cases, harelip was present in two instances.

The same carious condition of the maxillary incisor teeth was also observed in six of nine skulls in which the premaxillæ had failed to fuse with the maxillæ. (These nine cases were encountered in the study of twelve hundred skulls.) This incidence of caries is referred by the author to the creation of a lowered resistance through the persistence of the premaxillary bone as an independent structure, which is associated with a persistent infantile type of arterial blood-supply to the four maxillary incisor teeth. Imperfect nutrition must be held responsible as the immediate predisposing cause which permits the establishment of the carious process. The teeth of the upper jaw receive this blood supply from two different sources. The anterior dental artery, a branch of the suborbital artery, supplies the incisors and sometimes the canine tooth. The posterior dental arteries, branches of the alveolar artery, usually supply the canine and regularly the premolars and the molars. In the fetus and young child these two arterial systems are independent and the anterior dental artery has a more considerable size than the posterior dental arteries. Gradually, more and more important anastomoses become established between the different arteries, while the system of the posterior arteries comes to predominate at the expense of the anterior plexus. In the adult, the anterior artery is considerably reduced in size and receives a strong anastomotic current which extensively serves its area of supply.

Neuritis of the Trigeminal and Facial Nerve. H. Moral (Oestern, Ungar Vierteljahrsschrift für Zahnheilkunde, 1918) Revue Suisse d'Odontologie, 1918, xxviii, No. 4, p. 251.

In the case observed by the author, the trigeminal inflammation was characterized by sensory disturbances, while the facial neuritis manifested itself, proportionately to its spreading in a central direction, in the form of progressive paresis of the facial muscles, including the levator palpebrarum (ascending neuritis). The involvement of the nerves followed as a sequel after inappropriate treatment of the diseased pulp of an upper eye tooth. This had

apparently led to periodontitis, as well as cauterization of the mucosa, finally necessitating the extraction of the tooth. The origin of the neuritis is referred by the author to the presence of a disintegrated putrefying cotton pledget in the wound cavity and to the severe traumatization of the tissues.

RADIOGRAPHY, Etc.

Radium in the Treatment of Carcinoma of the Buccal Cavity. R. B. Greenough, Boston Med. and Surg. Jour., May 2, 1918.

The report deals with at total of 139 cases of mouth cancer, but not all of them were subjected to radium treatment. For example, of *cancer of the lip* there were 39 cases, but only 19 were given radium treatment. Of these, there was complete disappearance of the tumors in 4 and improvement in 4 others. The remaining 11 cases obtained but little benefit. *Cancer of the palate,* 8 cases; *cancer of the tonsil,* 7 cases; *cancer of buccal mucosa,* 5 cases. Of these 20 cases in all, 12 had radium treatment. No case showed anything more than temporary and symptomatic benefit, and the disease progressed with little or no delay to a fatal termination. *Cancer of lower jaw,* 36 cases; *cancer of antrum and upper jaw,* 11 cases. Of these 47 cases in all, 28 had one or more radium treatments. The upper jaw cases were all refractory and the disease was not materially influenced by radium. Six of the lower jaw cases had definite benefit from radium, and in one case, a local recurrence after operation, the disease was destroyed and no further recurrence has appeared in 20 months. *Cancer of tongue and floor of mouth,* 33 cases, 22 of which were given radium treatment. Definite improvement took place in 3 cases, but the disease was not eradicated. *Leucoplakia buccalis,* 8 cases, 4 being treated by radium with a certain amount of success. It is unquestionable that radium employed in sufficient strength can cause a disappearance of the milky mucosa, but only by an actual caustic action.

Radiology. A. Lloyd Kitchin. The New Jersey Dental Journal, 1919, viii, No. 3, p. 86. (Illustrated.)

Dental radiography is the science and art of making and interpreting radiographs of the teeth and associated parts. The author considers this important subject under four headings, as follows: (1) Manipulation of machine and tube. (2) Posing patient, placing plan and focusing tube. (3) Time of exposure. (4) Finishing negative. He emphasizes that the use of the radiograph in dentistry is not a mere fad, but a necessity if one wishes to render efficient dental service. The time of exposure ordinarily used in dental radiography is insufficient to produce any ill effects. A time exposure limit of two minutes, at ten to twenty milliamperes, at a distance of sixteen inches from the target to the patient is safe. A high tube, or one emitting rays of great penetrating power, is less dangerous than the weaker tube. Tubes that require 12 to 15 or more seconds an exposure for dental work, may cause a slight irritation after radiographing every tooth in the mouth (ten or more films).

In the realm of orthodontia, the radiograph is positively essential: (1) To determine the position of unerupted permanent teeth. (2) To determine how far to move teeth. (3) To observe moving teeth. (4) To locate impacted and supernumerary teeth. (5) In some cases to determine the cause of malposition of a tooth.

The following is a list of common errors in reading radiographs: (1) To mistake the mental foramen for an abscess of a lower premolar. (2) To mistake the anterior palatine foramen for an abscess. (3) To mistake the nasal cavity for necrosis of the palate. (4) To mistake the antra for abscesses. (5) To mistake the mandibular canal for a fistulous tract. (6) To mistake a cervical filling for a pulp stone. Proficiency in the interpretation of radiographs is only gained by continued observation.

Roentgen Ray Indications for Tooth Extraction. B. C. Darling. The American Journal of Roentgenology, 1919, vi, No. 3, p. 136.

The roentgenogram shows when the condition about the infected tooth is such that it menaces the health of the patient. The trained roentgenologist can diagnose the condition which indicates extraction. This he should prescribe, as at present no other method can be guaranteed to remove the focus of infection. Dental research is still working to find a completely aseptic method that will save the tooth and at the same time remove the focus of infection. But under present conditions, the weight of medical and dental practice is in favor of extraction if this is necessary to destroy the focus of infection. According to Dr. Harold L. Vaughan, extraction followed by surgical removal of the infected area is indicated in the vast majority of teeth showing periapical infection, and the routine conservative methods at present fall far short of the requirements in the removal of foci.

Dentists should be aware of the limitations of the roentgen ray examination and use every additional clinical method available. Roentgen rays are of the greatest value in diagnosis. The fact that the roentgenogram is necessary to and often decisive in diagnosis emphasizes the importance of its being made by a trained roentgenologist. Although mistakes in interpretation are always possible, the x-ray picture may be credited with possessing definite value as an indicator of the need for extractions and root amputations. "The diagnosis should be based primarily on the roentgen ray findings tempered by the clinical experience gained by the study of roentgen rays of other cases where the teeth and infected tissues had subsequently been removed giving a chance for comparison."

Extraction is required for the great majority of teeth showing periapical infection, as well as for teeth showing periodontoclasia or absorption of bone of the alveolar process by disease, as indicated on the film by the black line of pericementitis.

The International Journal of Orthodontia and Oral Surgery

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 801-809 Metropolitan Bldg., St. Louis, Mo.

Foreign Depots—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single copies, 50 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $3.00 per year in advance. Under foreign postage, $3.40. English price: 15/ per annum, 1/6 per number. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—Since it is not desirable to hold type standing longer than absolutely necessary, all requests for reprints should be made at time of submitting manuscript for publication. Rate card will be sent with galley proof.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 25 East Washington Street, Chicago, Ill. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 801-807 Metropolitan Building, St. Louis, Mo.

Illustrations—Such halftones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements—Objectionable advertisements will not be accepted for publication in this journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints tor nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter.

EDITORIALS

Shall the Classification of Dental Schools be Permanent?

SINCE the signing of the armistice, there has been considerable discussion in the dental profession, as to whether the classification of the dental schools as adopted by The Dental Educational Council of America, July 31, 1918, should be permanent. In reviewing the arguments for and against the permanency of this classification, it is very easy to see that those who are in favor of keeping the classification are men who are connected with Class A schools, and those who oppose it are those affiliated with Class B schools and other members of the profession who are broad-minded enough to see the inefficiency and unfairness of the classification as made by the Dental Educational Council of America. It has been a grave question in our minds, whether the necessity for the classification of dental schools as outlined by men from the war department ever existed.

If a necessity for that classification existed as a war measure, that necessity is entirely eliminated with the close of the war, as the classification was made for a working basis so they could decide which schools should be allowed exemption privileges for their students and which schools would not be allowed such privileges. Whether the classification in the first place was a wise thing as regards the schools, dental students, and the dental profession is an open question, but anyone who is familiar with the classification of schools as made by the Dental Educational Council of America, and who is fair, will admit that the classification is based upon an unsatisfactory rating, and consequently is one that is not going to do the dental profession any permanent good.

In looking over the list of schools that have been placed as Class A, and those that have been placed as Class B, we are confronted with some very interesting facts, and some which can not help but show why such a classification is unfair to the various dental schools, which have been given a Class B rating, and which also places some schools in Class A that should not be there, if judged according to the value which they and their faculty have rendered the dental profession in times past. In the first place the general plan for classifying these schools was entirely wrong, because the principal thing that was considered was that each school should possess a certain amount of equipment, or an equipment of a certain value for each student enrolled. It necessarily follows that upon that basis the schools with the smaller enrollment would be more apt to be placed in Class A than the large schools with the greater number of students, and this is exactly what has occurred. Such a classification will do the profession no good, because it has taken a wrong standard. A school can become a Class A school that has a small number of students and an equipment that is no more valuable than one which is placed in Class B because it had a larger enrollment. Again this classification was unjust and unfair, for it failed to take into consideration the past history of the school as related to the number of graduates that were successful in passing the state boards, and also failed to take into consideration the standing or rating of the faculty of the various schools. For instance a large number of Class A schools obtained their rating entirely upon their equipment, but if they had received their rating from the number of students that have been able to pass the state board over a period of ten years, or, if there had been taken into consideration the professional standing of the men composing the faculty, the schools would not only have dropped into Class B, but a number of them would even have been placed in Class C. For instance, we find some schools rated as Class A which have shown before state boards as high a percentage of failures as 30 per cent. We also find certain Class A schools with men on their faculty who have never done anything for the dental profession, have never made for themselves an enviable name or reputation, in fact, the faculty is composed of men that have never been able to do enough in the dental profession to have received any national recognition. We, therefore, contend that the basis of the classification is radically wrong, because it has placed a value on equipment, which may consist of electric lathes and fine work benches, and has paid no consideration to the personnel of the faculty or the product which the school has turned out, namely, graduates.

We believe the most important factors in making a rating of dental schools

should be the number of graduates that have been able to pass the board, and second the professional standing of the men composing that faculty; any rating or classification which does not consider these things, is necessarily a faulty and useless one.

The Dental Educational Council of America was also influenced in rating schools by the selecting of a curriculum and the naming of a certain number of subjects which should be taught. A few of those subjects do not add any professional value to a dental education. Also, some of those subjects as named, were contrary to requirement which had been laid down by the Commissioners of Education of some states as governing dental education, with results that certain colleges could not teach those subjects, because the subjects recommended should have been taught before the student came to dental college. Consequently schools in those states regardless of the number of students that were able to pass the state board each year, regardless of the amount of equipment that they possess, and also without any consideration of the prominence of the men that compose the faculty were placed in Class B according to the aristocratic and autocratic action of the Dental Educational Council of America. Any classification of schools, medical or dental or others, that is based upon the amount of equipment is wrong and misleading, and is not going to be a wise and good thing.

Anyone looking over the classification of dental schools will be impressed with the fact that the personnel of the faculty has had absolutely nothing to do with it, and in fact such a thing was not mentioned in the requirement for classification as laid down by the Dental Educational Council of America. Neither was any stress laid upon the fact that certain percentage of the graduates of the school should pass the state board examination. In other words the two most important things have been neglected, namely, the ability of the faculty to instruct students, and the ability of the product of that college to render a valuable service to the public. The thing that was considered was the most unessential and invaluable, namely, the amount of money which had been invested in equipment for students. In calling attention to some of the injustices which have been done in the classification of dental schools as made by the Dental Educational Council of America, we find that both of the New York Dental Schools have been placed in Class B owing principally to the fact that the Commissioners of Education of New York require that the dental schools teach certain subjects and that they must not teach other subjects. On account of this alone they were forced to be placed in Class B, and second, the attendance of both of these schools was large and we doubt whether they had sufficient property pro rata for each student enrolled. On the other hand, schools that have a small enrollment have been given a Class A rating because they had a very small number of students.

Again we find dental schools that have done a large amount of good for the profession, schools with a large alumni and which have turned out a large number of graduates who have successfully practiced dentistry and rendered a valuable service, schools that have men on their faculty with international reputations have been placed in Class B because they did not fulfill the autocratic and unfair requirements set down by the Board of the Dental Educational Council

of America, namely, a fixed amount of equipment for each student. Going over the list we were first impressed by the fact that the Chicago Dental College, Washington University, St. Louis University, Vanderbilt University, University of Buffalo, Indiana Dental College, and a large number of other schools that have rendered valuable service to the profession have been placed in Class B. During the last few years there has been no dental school in America that has possessed so valuable or so good a faculty as the Chicago Dental College. On the faculty of the Chicago Dental College there have been more men who have written textbooks and are international authority, than any other college in America. We need only to mention Brophy, Johnson, Case, Logan, Buckley, Roach, Hall, and Borland, all of whom are recognized authorities, which shows the faculty has been second to none, yet it was given a Class B rating.

The question might be asked, why have some of these schools in Class B such a large attendance year after year? The principal reason has been that they have possessed a faculty which has been attractive to the students, and have been able to turn out graduating classes that were successful in passing state boards and rendering a service to the public. This is much more than can be said in regard to a number of schools that have been placed in Class A that possess faculties composed mostly of men who are unknown beyond the "city limits" and also who have turned out graduating classes that have been unsuccessful to a great extent in passing state boards. We are aware of the fact that a large number of the schools that have been placed in Class A pay particular attention to the marble halls, ball-bearing lathes, electric engines, fountain cuspidors, and cabinets, all of which are used to greatly impress the freshman student, and to make him believe that a fine building and beautiful equipment is all that is necessary for him to learn dentistry. Anyone who is familiar with the demands of dental education, realizes that nothing could be more untrue or unfair to the freshman or prospective dental student, than to befog his mind with any such issue.

The important and most necessary vital thing in the teaching of a dental student is that the faculty be composed of men who have been successful in their various lines of work, men who because of long years of service have demonstrated their ability to teach dentistry in such a manner that dental students can pass the state board examinations and be a success in their chosen profession. It matters not how fine the equipment may be, unless the faculty possesses the requirement which we have mentioned, the dental school is going to be a second rate or a third rate school based on value it renders the public, even though it is placed in Class A because of the fine equipment.

We are perfectly willing to admit that probably a classification of dental schools is advisable, but we insist that in fairness to the dental profession and dental students, the most important thing in considering that classification be based upon the professional standing of the faculty, and the results produced in the student body. In other words, the most important thing to make the dental education a success is the standing of the men teaching the students, and secondly the ability of the student to go out and render a service to the public, first by passing the state board, and then performing an efficient dental service. Because those last two features were not considered in the classification of dental

schools by the Dental Educational Council of America, July 31, 1918, we believe the classification made at that time possesses no value, and that any dental school which still holds up that rating as evidence of superiority is taking advantage of the students, placing themselves upon a pedestal which they are not qualified to occupy, unless they can fulfill their sphere in life with relation to the other two requirements we have mentioned. At the present time we are very sorry to say, that too much attention is being given to fine equipment in dental schools, that can be bought with dollars and cents and which can be rated in commercial terms, and not enough is given to selecting of a faculty able to deliver to the students the things they should know, and the things which are going to be a benefit to them and to the public when they finish their professional training. In other words, an autocratic classification by an educational council based upon the value of equipment for each student is not going to take the place of an intelligent faculty, made up of men who have demonstrated their ability to teach dentistry as it should be taught.

New Orleans and the National Dental Meeting

IN accepting the honor of entertaining the National Dental Association, October 20-24, New Orleans feels that it can discharge the responsibility in a manner most satisfying to every delegate. This will be one of the most important gatherings of the year and every effort will be put forth to impress upon the visitors that the famed hospitality of the South is yet a dominant factor in its life.

In New Orleans 1919 shakes hands with 1719 every day.

One side of the city is a hustling, swarming American metropolis. The other side is a page from yesterday; a soul-stirring relic of bygone centuries; a glimpse far into the background of time; an old canvas daubed with the mellow colors of France, Spain, England and America blended into a harmony of history.

Fabulously wealthy in authentic historical episodes, New Orleans offers to national dentists an opportunity to study a famous past which no other American city affords. The scenes of history, the buildings of history on the sites of history are vital and living—preserved through two centuries for the eyes of 1919 to view as the eyes of 1719 viewed them.

What will you see in New Orleans?

This, my friend, and much more:

Scene of the Battle of New Orleans on Chalmette field; General Sir Edward Pakenham's headquarters in which he died of wounds after the battle; levee scenes where Farragut steamed up the Mississippi to find millions in cotton and molasses ablaze along the levees; the old Cabildo whose stone-paved rooms Lafayette trod, under whose roof took place the formal transfer of the province of Louisiana from France to the United States; the ancient St. Louis Cathedral where General Andrew Jackson bowed his head in the "Te Deum" that celebrated his victory in the Battle of New Orleans; Jackson Square where landed the

exiled Acadians made immortal by Longfellow in Evangeline; French Market, gathering place of slaves and their mistresses in the dim, dark past; Old Absinthe House built in 1789 and still a favorite resort; the house built for Napoleon who was to be rescued by a Louisiana crew; the old French Opera, the first ever built in America; Jean Lafitte's blacksmith shop and the Archbishopric, the oldest original building west of the Alleghenies.

Nor are these all the historical settings in New Orleans. There are streets lovely with the lace-like arabesque of iron work galleries made by Creole artisans. There are white-pillared houses with broad galleries of ancient times. There are parks that were plantations. There are restaurants and coffee houses descending through five generations of chefs from father to son, with the old quaint customs.

And while old New Orleans, because of the charm of its ancient tradition and its romantic history, offers the visitor a rare opportunity for enjoyment, modern New Orleans none the less affords a big attraction.

Fourteen miles of steel and concrete, weather protected docks facing the greatest inland harbor of the world; gigantic warehouses and grain elevators equipped with all the machinery which modern science has invented; a thirty-two foot deep navigable Canal stretching out through the very heart of the city from the banks of the Mississippi to the shores of Lake Pontchartrain, providing water frontage for all manufacturing sites; great shipbuilding plants already at work, employing thousands of men on the banks of this Canal; a wonderful climate, assuring twelve working months to each year, a perfectly drained and sewered city with hundreds of miles of paved street, rat-proofed homes and yards—this is partially the story of modern New Orleans,—the New Orleans which the rest of this country knows so little about!

Its people have seriously taken the big tasks of a new day, and their dream is to make certain the prediction of a great man who recently visited us when he said:

"The city is destined soon to become not only the second port but in all probability the second city of America."

This is the half-told story of the old and the new New Orleans, the story which such a limited number of people know. It is the story of a great American city, "living, breathing, and growing greater every hour."

WILLIAMS

Saves Time

WILLIAMS MAT GOLD

Your time is the most valuable part in the operation of making a gold filling.

Williams Mat Gold Saves Time

If time is a vital factor with the dentist, the permanency of the restoration is also vital to both dentist and patient.

A Williams Mat Gold Filling will last from ten to twenty years.

If you have never tried Williams Mat Gold, ask your dealer for our introductory outfit—1-10th oz. gold, 10 instruments and handle—put up in morocco plush lined case—all for $7.00, with the Williams guarantee "Use part of the gold," if not satisfactory "your money back."

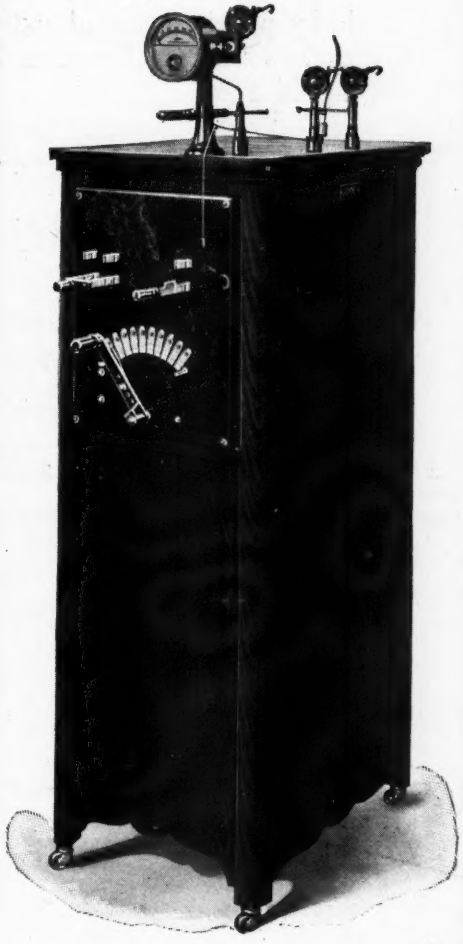
SCRAP GOLD REFINING

Write for our proposition on scrap gold refining.

The Williams Gold Refining Co.
Smelters and Refiners
Buffalo, N. Y. Bridgeburg, Ont.

Now Ready for Distribution

Universal Dental X-Ray Transformer



Operates on any cycle alternating current, 110-220 volts. *Noiseless, Speedy, Perfect Regulation. Eight inch Spark Gap.*

THE TUBE is the latest invention—a real discovery—self-regulating—has all the advantages of the Coolidge tube for this work—none of its drawbacks.

Our distributor will install and demonstrate without extra charge.

Send for Bulletin No. 111.

THE WM. MEYER COMPANY
818 W. Washington Blvd. Chicago

ALLOY "J"

By word of mouth only has ALLOY "J" been advertised. For three years this superb orthodontist's material has been tested in hundreds of practical cases and so satisfactory has it proven that its good qualities have been extolled at clinics, dental meetings and friendly chats. One orthodontist tells another—an inquiry—then a sale.

Made by precious metal experts whose whole energy for generations has been in this line, for ALLOY "J" is a platinum-palladium-gold alloy.

RIBBON——————————WIRE

BAKER & CO., INC.

REFINERS AND WORKERS
OF PLATINUM-GOLD-SILVER

NEWARK, N. J.

NEW YORK OFFICE, Hudson Terminal Bldg. CHICAGO OFFICE, Mallers Bldg.

CONTENTS FOR JULY

Original Articles

A Preliminary Study of the Effect of Rickets on the Jaws. By *Hugh K. Hatfield, M.D., D.M.D.*, Boston, Mass..... 367

Preventive Orthodontia. By *Raymond J. Wenker, D.D.S., M.D., B.Sc.*, Milwaukee, Wis. 380
History of Orthodontia. By *Bernhard Wolf Weinberger, D.D.S.*, New York City.... 388

Department of Oral Surgery and Surgical Orthodontia

Some Pathologic Conditions of the Mouth and Their Treatment. By *Chalmers J. Lyons, D.D.Sc.*, Ann Arbor, Mich..... 399

Department of Dental and Oral Radiography

The Uses of the X-Ray in Modern Dentistry and Medicine. By *Fred W. Zimmermann, D.D.S.*, Youngstown, Ohio..... 410

Abstract of Current Literature

Orthodontia, Oral Surgery, and Radiography..... 416

Editorials

New Orleans and the National Dental Meeting..... 428
Program of National Dental Association..... 430